

Mining

CONGRESS JOURNAL



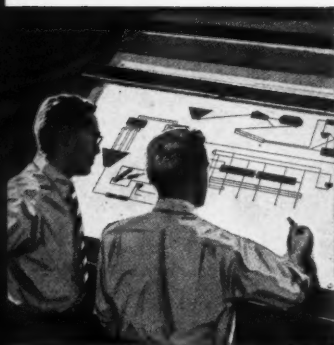
JANUARY
1953



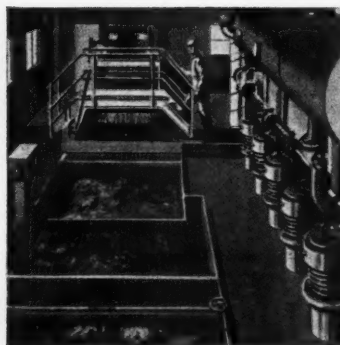


The Inland Steel, Price, Ky., preparation plant built by Link-Belt provides low-cost mechanical ash removal.

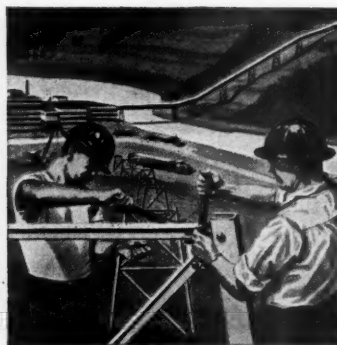
Here's what it means to you when LINK-BELT accepts total responsibility



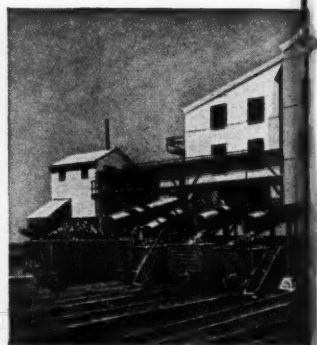
OVERALL ENGINEERING. Vast experience of nation-wide design and field engineering staff integrates all factors, assures expert planning.



QUALITY EQUIPMENT. Link-Belt itself builds a broad line of coal preparation, handling and power transmitting equipment.



COMPLETE ERECTION. Experienced erection superintendents, staffs and skilled crews carry through entire job down to last detail.



SATISFACTORY PERFORMANCE. When you rely on Link-Belt as a single source, Link-Belt accepts responsibility for overall operation.

Inland Steel reduces ash content of raw coal

WHEN Inland Steel wanted a new plant at Price, Ky., for the efficient preparation of metallurgical coal—they turned the job over to Link-Belt. From the modern buildings that house the equipment—to mine car dumping, coal cleaning, coal handling and refuse disposal machinery—it's Link-Belt all the way.

Today Inland Steel processes 750 tph of raw coal. Equally important, the new

plant permits "full seam" mining. Extracting coal in areas formerly uneconomical steps up ton-per-man production permitting recovery of a larger per cent of the deposit.

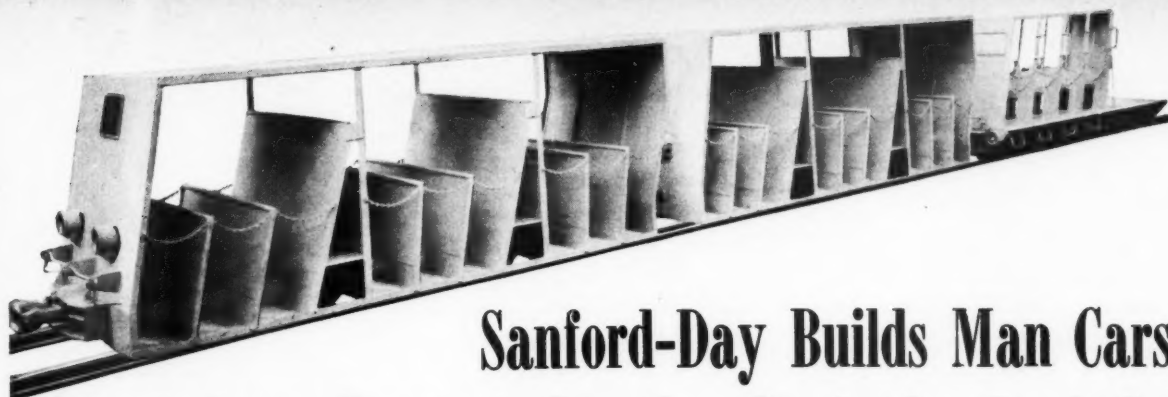
Find out how you can utilize Link-Belt's total responsibility. On small jobs as well as large, an engineer in the Link-Belt office near you will be glad to demonstrate how Link-Belt's vast resources can serve you.

LINK-BELT COMPANY: Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Seattle 4, Toronto 8, Springs (South Africa).

LINK-BELT

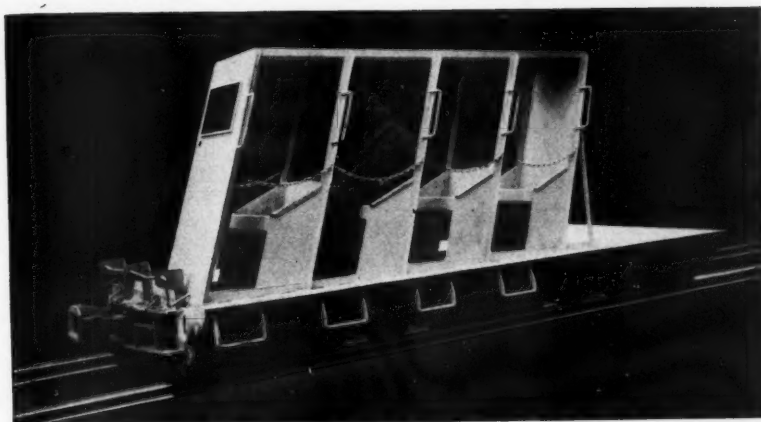
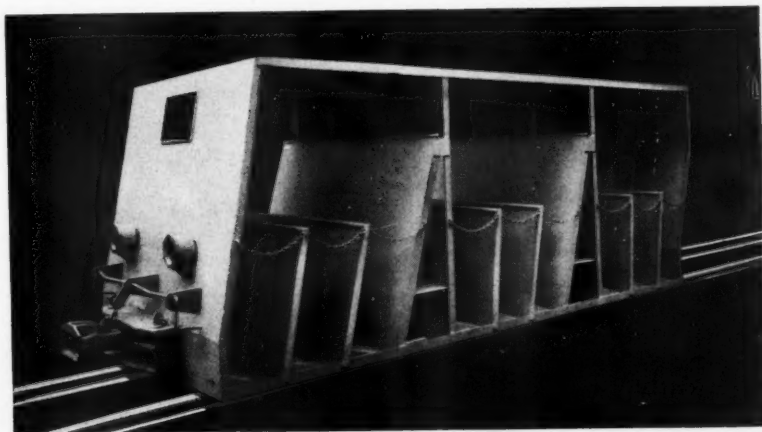
**COAL PREPARATION
and HANDLING EQUIPMENT**

19,028



Sanford-Day Builds Man Cars with Safety Control Car for Peabody Coal Co.

ANOTHER GOOD EXAMPLE HOW SANFORD-DAY'S PRACTICAL
CAR ENGINEERING CAN SAVE YOU MONEY...



TOP PHOTO—Man Car is 19 feet long by 7 feet wide by 6 feet 9 inches high. Car has safety chains, sealbeam headlights, safety glass window and silent rubber cushion type wheels. Passenger capacity 36 to 45 men.

BOTTOM PHOTO—Safety Control Car is 18

feet long by 7 feet wide by 6 feet high. Car has safety chains, sealbeam headlights, safety glass window, three pair of GE Electric Shoe Brakes, automatically governor-controlled and/or push button controlled, and silent rubber cushion type wheels. Passenger capacity 4 maintenance men. Supply capacity 75 sq. ft. deck space.

Peabody needed cars to transport personnel at its No. 10 mine. The cars were to operate by cable on a 16 degree slope. Safe transportation was the first and foremost consideration of Peabody officials. In order to achieve this end an additional car incorporating all safety features was designed. This car, called the Safety Control Car, also operates independently transporting supplies and maintenance personnel.

Due to the relatively short haul and available head room in this case, Sanford-Day designed a man car in which personnel could stand rather than be seated. Because this car accommodates a large number for its size, only two-man cars were necessary.

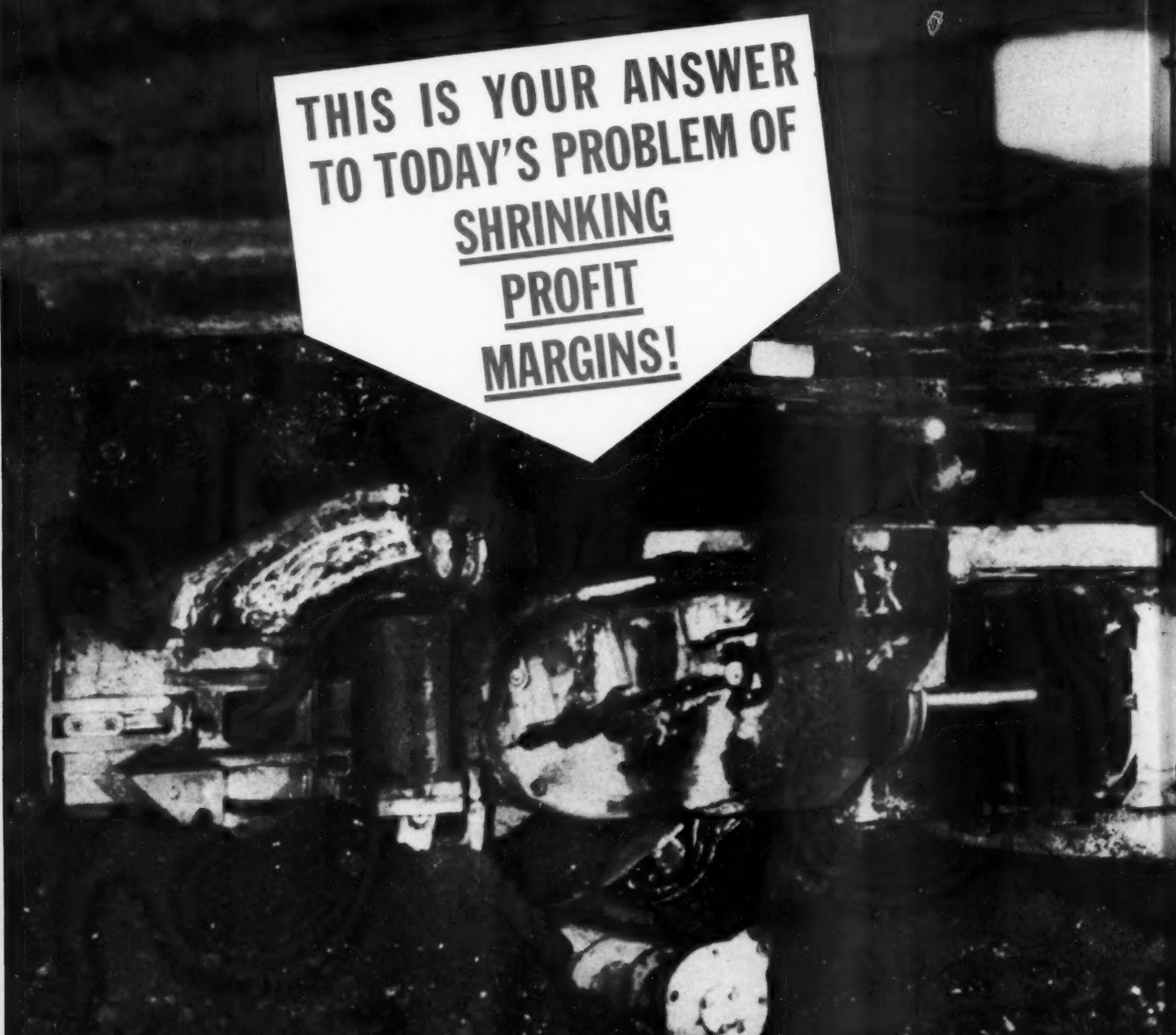
The Safety Control Car and Man Cars have no costly streamlined construction. They are compact all-steel units with each steel member an integral part of the frame work. Result: minimum manufacturing cost which means you pay less.

This is just one of hundreds of cases where an operator has turned to Sanford-Day for a practical solution to a problem. Nothing is overlooked to make Sanford-Day Man Cars your best possible buy for safe and efficient personnel transportation. For complete information, write us today.

SANFORD-DAY IRON WORKS
KNOXVILLE TENNESSEE

Devoting Our
Entire Capacity
to the Building
of Better Mine
Cars for Over—

50
YEARS

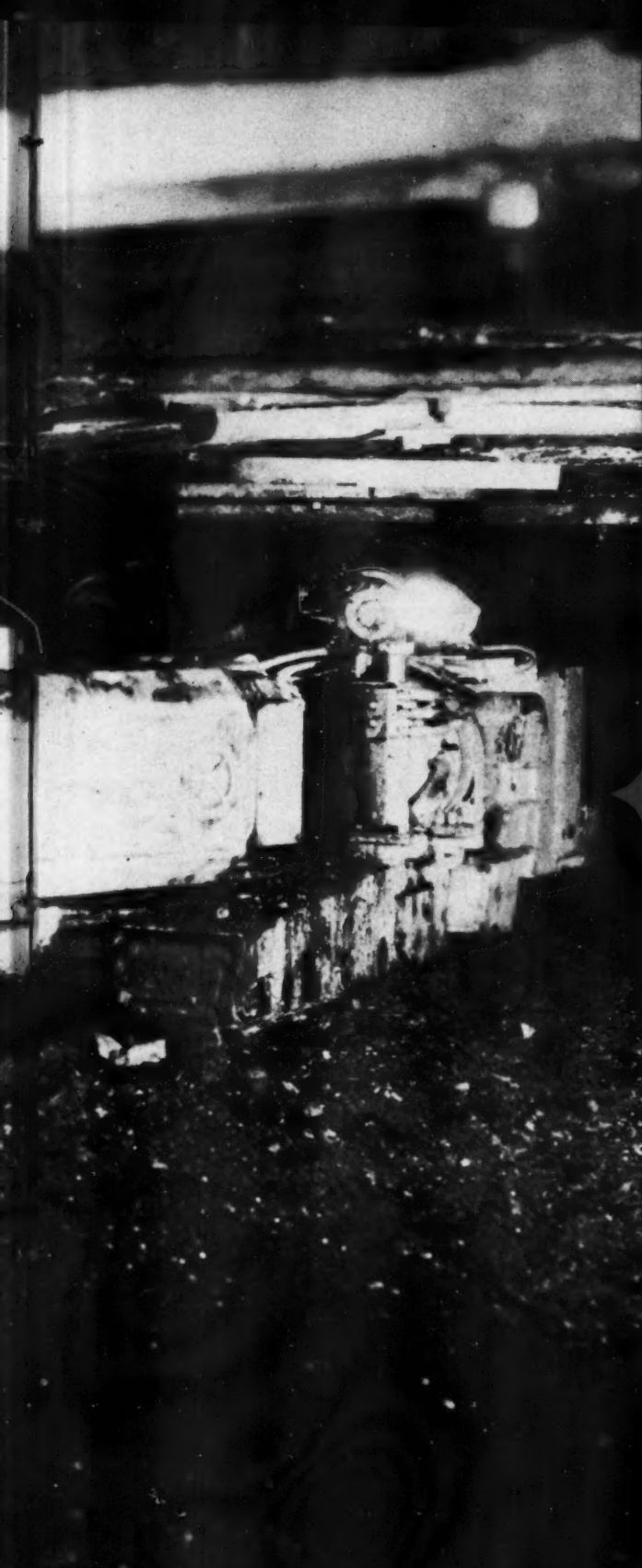


**THIS IS YOUR ANSWER
TO TODAY'S PROBLEM OF
SHRINKING
PROFIT
MARGINS!**

**HERE'S A TYPICAL MONTH'S PERFORMANCE
OF THE JOY CONTINUOUS MINER PICTURED ABOVE**

	<u>Day Shift</u>	<u>Night Shift</u>
<i>Number of Working Days</i>	22	22
<i>Length of Shifts: Hours</i>	7:00	7:00
<i>Average Machine Operating Time: Hours</i>	4:38	5:07
<i>Average Feet Advanced per Day</i>	105	122.7
<i>Average Production: Tons per Man Day</i>	42.4	50.3
<i>Average Cost per Ton (Labor: 7-man Crew)</i>	\$.37	\$.32

This machine is a 3JCM Continuous Miner, the Joy low-vein Model. It is working in 55" coal which has a 2" parting in the middle of the seam. The machine is charged with a 7-man crew on each shift, which includes the operators of all mechanical equipment, as well as a boom man who shifts cars under the belt conveyor, and a roof-bolting man.



In thin seams
or in
thick seams

The **JOY**
**CONTINUOUS
MINER**

marks a new era
of Efficiency
and Low Cost
in coal mining

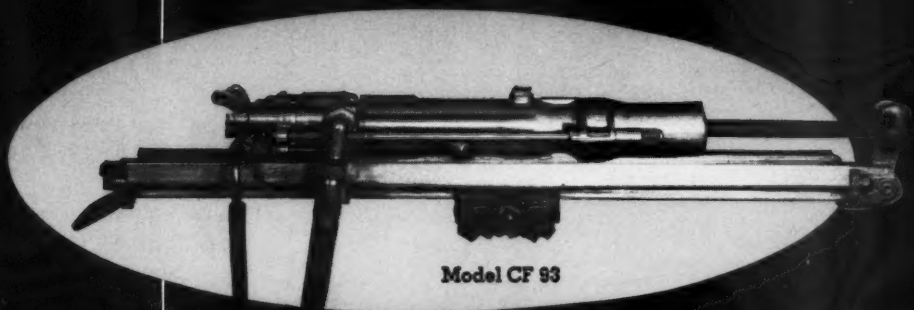
*Consult a
Joy Engineer*

WAD CL 2289

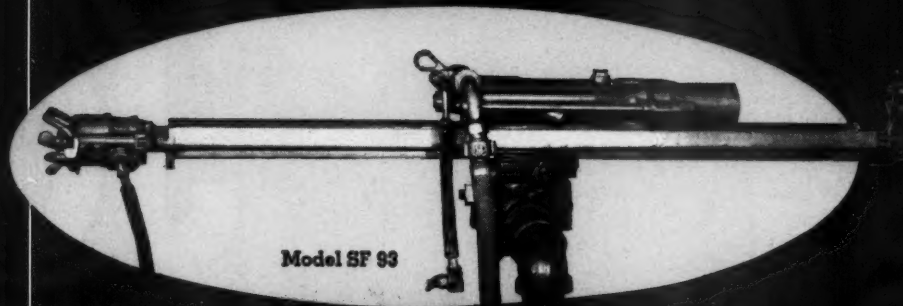
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.





Model CF 93



Model SF 93

Introducing the 3½" GARDNER-DENVER 93
...the **EAGER DRIFTER!**

Equals most 4" machines in drilling speed.
Exceeds all other 3½" drills in hole-cleaning ability.
Maintains correct bit pressure automatically —
regardless of ground changes.
Long feed aluminum alloy mounting — with automatic
feed motor on drill backhead or on guide shell.
Ask for Bulletin DD-2 — It gives complete specifications.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd.,
14 Curity Ave., Toronto 13, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

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VOLUME 39, NUMBER 1

FOR JANUARY, 1953

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Photo courtesy Calcium Chloride Association

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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Member Audit Bureau of Circulation



How Allis-Chalmers MOTOR SCRAPERS Help **Cut Cost per Yard**



Positive, forced ejection . . . eliminates wasteful circling or other time-consuming methods of removing the load. Allis-Chalmers' patented forced-ejection system plus high apron lift *bulldozes* dirt out of the bowl fast every trip . . . without extra wear and tear on power control unit cables and clutches.



Easy operation. From foam rubber seat to finger-tip control, shock-free hydraulic steering and full visibility, a TS-300 operator has every available help for safe, sure, speedy work. Balanced weight distribution and low center of gravity make A-C MOTOR SCRAPERS easy to maneuver even at top speed.



Faster, easier loading . . . because A-C MOTOR SCRAPERS have up to 20 hp. to handle every struck yard . . . plus offset cutting edges and "center-boiling" loading action that spills the dirt evenly, filling corner voids for full capacity loads.

High-speed hauling. The power behind the TS-300 teams up with big, traction-type tires that gear it to the road . . . move capacity loads at 22.5 mph. And operating clearance of 20 in. helps keep it from hanging up on rutted haul roads.

by Cutting Time per Yard



A dirt-moving "package" that makes every second count. The powerful HD-20 torque converter tractor is an ideal teammate for the TS-300. It synchronizes to scraper speed at contact . . . automatically loads at fastest speed conditions permit with less strain on operator and equipment . . . gives scraper an extra fast start to the fill.

Your nearby A-C dealer will be glad to give you more yardage-boosting facts about job-tested, *job-proved* MOTOR SCRAPERS. He can also tell you where you can see them at work and talk to the men who own and operate them. You owe it to yourself to call or stop in soon.

TS-300 MOTOR SCRAPER

14 cu. yd. struck capacity
18 cu. yd. heaped capacity
280 hp. Buda diesel or
275 hp. Cummins diesel

TS-200 MOTOR SCRAPER

10 cu. yd. struck capacity
13 cu. yd. heaped capacity
176 hp. Buda diesel or
165 hp. Cummins diesel

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



THE FINEST LINE ON EARTH

NO NEED TO SWITCH STEELS WHEN YOU NEED TO SWITCH BIT TYPES!



Both Timken® bit types fit the same steel!

YOU don't need to switch steels, or stock more than one kind, when you use Timken® interchangeable rock bits. Timken multi-use and carbide insert bits both fit the same threaded drill steel so that you can change quickly to the most economical bit as the ground changes. And you can do it right on the job!

In ordinary ground, when full increments of steel can be drilled, Timken multi-use bits, with correct and controlled reconditioning, will give you the lowest cost per foot of hole.

If you hit hard and abrasive ground, you can switch quickly to Timken carbide insert bits. They're your best bet for maximum speed drilling, constant-gage holes, small diameter blast holes and very deep holes.

Be sure to have both types of Timken bits on hand and you'll have the best answer to every one of your drilling problems.

Timken multi-use and carbide insert bits are inter-

changeable in each thread series. And both types have these three important advantages: (1) made from electric furnace Timken fine alloy steel, (2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, (3) quickly and easily changed.

Timken rock bit engineers have 20 years' experience in solving drilling problems. Let them help you select the best bits for *your* job. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

**your best bet for the best bit
... for every job**

WHY FEED THE GOB PILE WITH WASTED RAIL?



We know that a good many operators would welcome a way to reduce or eliminate rail waste. In mines that still cut and curve their own rail, the waste often amounts to 5 pct—and 10 pct is not at all uncommon. As much as 100 ft in every 1000 ft of delivered rail!

No need to remind you how the cost of this can mount up in a year. But there's a way to get around it—and, at the same time, to improve your haulage system.

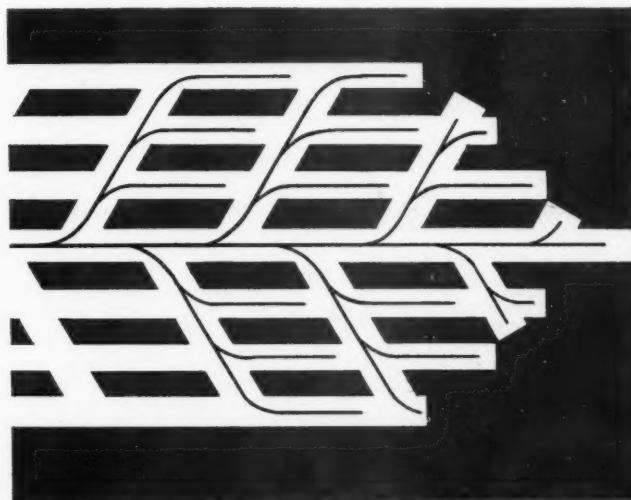
The answer is Bethlehem Prefabricated Mine Track, in which the rail comes to you precut to proper lengths, precurved to just the proper radii. Any leftovers are immediately available as scrap at the mill. There isn't a foot of wasted rail in the Bethlehem layout built for your mine; no waste in the straight rails, none in the curved rails, none in the turnouts.

You wonder how this can be done? Well, first a Bethlehem engineer makes a complete study of your haulage plan; then the trackwork is figured to your individual needs, and built accordingly.

Why not let us give you all the facts? The saving in rail is only *one* part of the story. There are several other ways in which Bethlehem Prefabricated Mine Track means substantial economies . . . not to mention better haulage. Full details at your request.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

*On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation. Export
Distributor: Bethlehem Steel Export Corporation*



One of many typical Bethlehem Prefabricated Mine Track layouts. No waste, no misfit parts, no difficult installation problems.

What Does it Cost to Move a Yard of Earth?

Three MARION 191-M shovels are handling the excavation work for two giant dams on the Missouri River. Their records in soil, clay, shale and rock are making excavating history that will be significant in heavy construction and mining.

Big dipper capacity, tremendous power and real speed (18-second cycle time—as fast as your smallest machine) make the MARION 191-M an outstanding performer where big yardages are needed. What is the cost of moving a yard of dirt, rock or ore? The 191-M provides new and interesting answers. Write for the details.

MARION POWER SHOVEL COMPANY

Marion, Ohio, U. S. A.



from $\frac{3}{4}$ cu. yd. to 45 cu. yds.

Offices in Principal Cities Throughout the World



MARION 191-M, the world's largest loading shovel, at Ft. Randall Dam.



MARION 191-M

Provides New Answers!





looking
for a

tough mine power cable?

it's **ANACONDA BUTYL-INSULATED**
High Voltage Cable

No metal armor or lead sheath, yet . . .

There's even greater mechanical and electrical protection in the combination of *neoprene jacket* and *butyl insulation*.

Together they provide:

Unequalled protection from impact, crushing, twisting and abrasion.

Higher dielectric strength.

Greater resistance to moisture, acids, oils, ozone, heat and flame.

Less weight, more flexibility; easier to handle, install,

splice and maintain. Lower first and final costs!

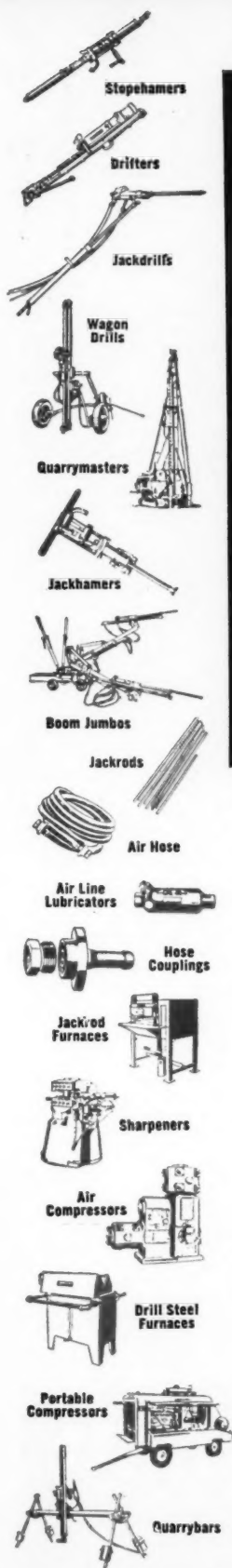
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ANACONDA Butyl-Insulated High Voltage Cable is the modern cable for any mine—particularly mechanized mines. Anaconda also specializes in the manufacture of shuttle car cable and cable for the new continuous mining machines. Let our mine service specialists show you, or get in touch with your near-by Anaconda Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



the right cable for the job

ANACONDA[®]
WIRE AND CABLE



Everything for Drilling Rock
FROM THE CARSET JACKBIT
BACK TO THE COMPRESSOR

TO make the best recommendation for rock drilling equipment you must imagine yourself in the bottom of the drill hole. That's where the real results show up. From there you see only the Carset Jackbit.

But behind this Carset Jackbit there's a completely coordinated line of Ingersoll-Rand rock drilling equipment. Current models of Drifters, Stopers, Jackhamers, Wagon Drills, Jackdrills and Quarrymasters were all designed to take full advantage of longer-lasting, faster-drilling Carset Jackbits. Add rod and bit shop equipment, mountings, accessories and air compressors, and you have a complete I-R line backed by 80 years of experience, unequalled rock drilling know-how and undivided responsibility.

The Carset Jackbit with correct I-R supporting equipment is cutting rock-drilling costs, cutting operator fatigue and increasing production the world over. Whatever your drilling problems, consult your local I-R representative. He can help you solve them.

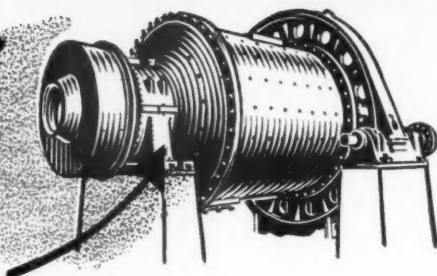
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 11 Broadway, New York 4, N. Y.



837-5

ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • CONDENSERS • DIESEL AND GAS ENGINES

"Inside Story"



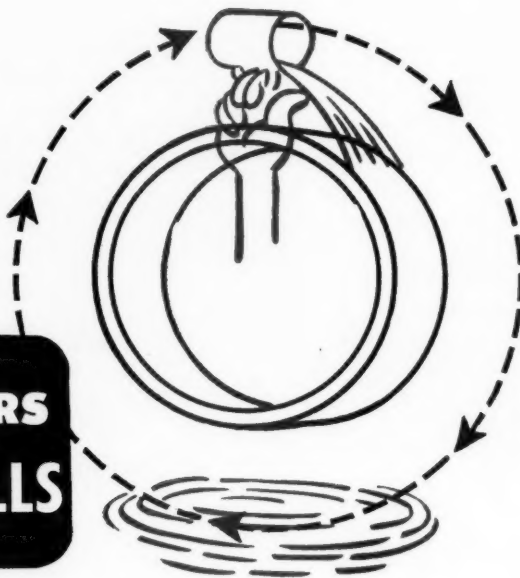
of Allis-Chalmers Oil Lubricated Trunnion Bearing...

AN OILING BUCKET inside this Allis-Chalmers trunnion bearing revolves with the trunnion . . . lifts oil from the reservoir in the bottom of the bearing housing to an oil distributing pan above the bearing. From here it floods down onto the bearing, lubricating the full face of the bearing uniformly and continuously.

You'll always have the comforting assurance that the all-important trunnion bearing on your mill is being dependably lubricated. This assured protection of internal lubrication is standard on all Allis-Chalmers oil lubricated bearings — even on installations where a separate external oiling system is used.

A-3722

ALLIS-CHALMERS GRINDING MILLS



These protective features of A-C trunnion bearings also give you savings in power and maintenance —

- ★ An improved seal keeps dirt out of oil and has been designed to provide for mill expansion.
- ★ A hand operated, high pressure lubricant pump "floats" the mill after shut-down . . . eliminates dry starting.
- ★ If desired, an external system for filtering and cooling can be added to the internal oiling system.

Get more facts from the Allis-Chalmers representative in your area, or write for Bulletin 07B6718A. Allis-Chalmers, Milwaukee 1, Wis.

ALLIS-CHALMERS



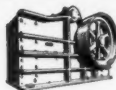
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Principal Cities in
the U. S. A. Distributors
Throughout the World.



Hammermills



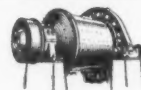
Vibrating Screens



Jaw Crushers



Gyratory Crushers



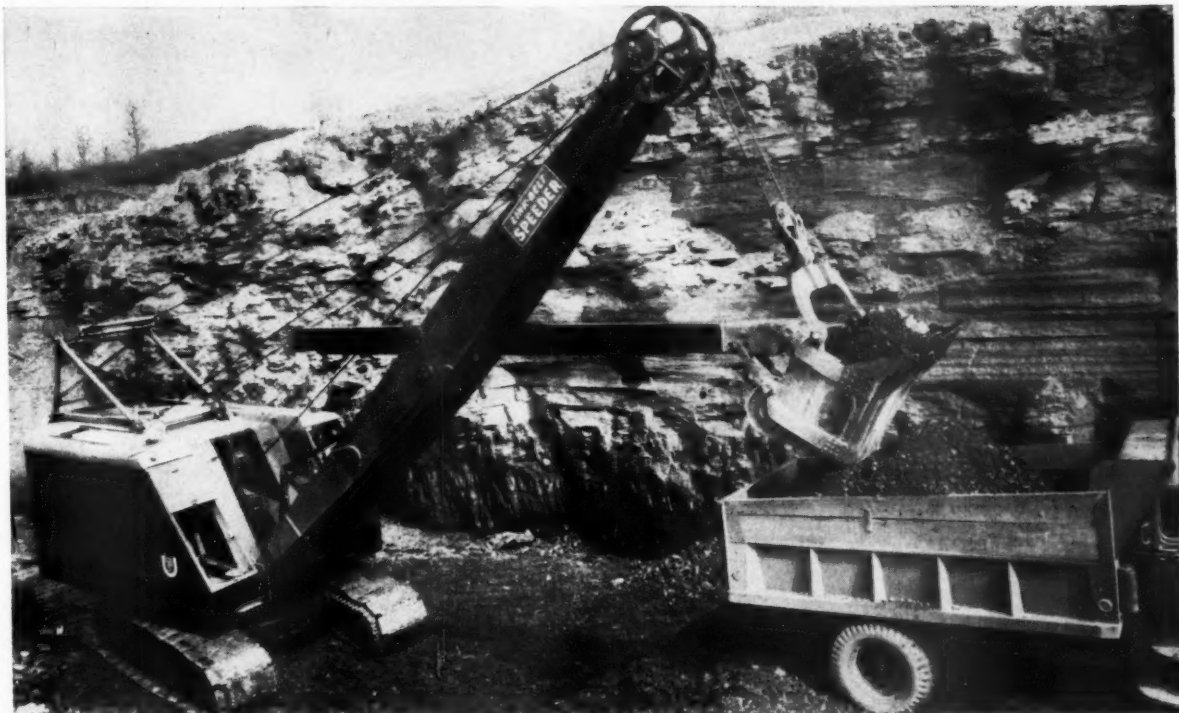
Grinding Mills



Kilns, Coolers, Dryers

Before you buy:

CHECK SERVICE RECORDS!



Pictured is a K-370, long reach stripping shovel, also used for loading coal.

Quality construction slashes maintenance costs ... matchless service minimizes downtime

WHAT OWNERS AND OPERATORS SAY ABOUT LINK-BELT SPEEDERS ...

OWNER — "Only service in 18 months was two sets of cable, minor dipper repairs."

OWNER — "... really fine distributor service."

OWNER — "My Link-Belt Speeder not only replaced two smaller rigs, but cost only \$115 for service in five seasons!"

OPERATOR — "Running it over two years with no downtime."

OWNER — "Best dollars I ever spent..."

OPERATOR — "... easy access for service. Self-cleaning crawler treads are really good!"

OPERATOR — "Only one clutch adjustment in eight months!"

WITH a Link-Belt Speeder, you're sure to get maximum production at minimum cost—not only for this season ... *but for many seasons to come!* Also, with Link-Belt Speeder's world-wide factory-trained distributor service, you can be sure of prompt, expert service or parts replacement when you need them.

What's more, in every area there is a Link-Belt Speeder resident service engineer. It's his job to be familiar with you and your particular problems.

If you'd like more information about the most complete line of crawler, wheel or truck-mounted shovel-cranes write for Catalog 2373.

LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

19,055

LINK-BELT SPEEDER

CORPORATION

BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND
WHEEL-MOUNTED SHOVEL-CRANES

**FACTORY-TRAINED
DISTRIBUTOR SALES
AND SERVICE SPECIALISTS
... EVERYWHERE**



Improved Fragmentation—Reduced Concussion—Increased Safety

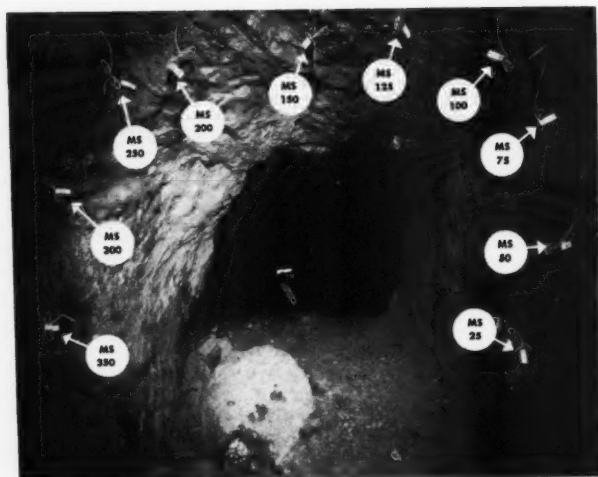
IN ORE MINE USING DU PONT "MS" DELAY ELECTRIC BLASTING CAPS

To obtain superior fragmentation . . . reduce concussion . . . and increase the safety of underground blasting operations, many prominent iron ore mines are using Du Pont "MS" (Millisecond*) Delay Electric Blasting Caps.

Miner (at left) makes up primer with "MS" Cap for typical shot in a sub-level stope of midwestern iron ore mine. In this case, the blast consisted of 10 holes in a vertical ring parallel to the stope face and having a horizontal burden of eight feet. Hole depths ranged from 20 to 25 feet.

The shot contained a total of 300 pounds of "Gelex" No. 2, 2" x 16", a cohesive semi-gelatin which has proved very popular for mining iron ore. The holes were primed full depth with Primacord and were initiated with Du Pont "MS" Delay Electric Blasting Caps arranged as indicated in the lower photo. This midwestern mine has consistently reported (1) better breakage, (2) substantially reduced concussion, and (3) improved safety resulting mainly from less unexploded dynamite in the muck pile.

Like all Du Pont electric blasting devices, these split-second "MS" Caps are made with waterproof rubber-plug closures, plastic insulated wires and aluminum foil shielded shunts . . . assuring the utmost in safe handling and use. A steadily growing number of ore mines are discovering that "MS" Delays provide greatly improved over-all efficiency as compared to former blasting methods. Why not try them in your own mine? The Du Pont Explosives representative in your own area will gladly give you complete information on these short-interval delays and other Du Pont blasting supplies and accessories. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.



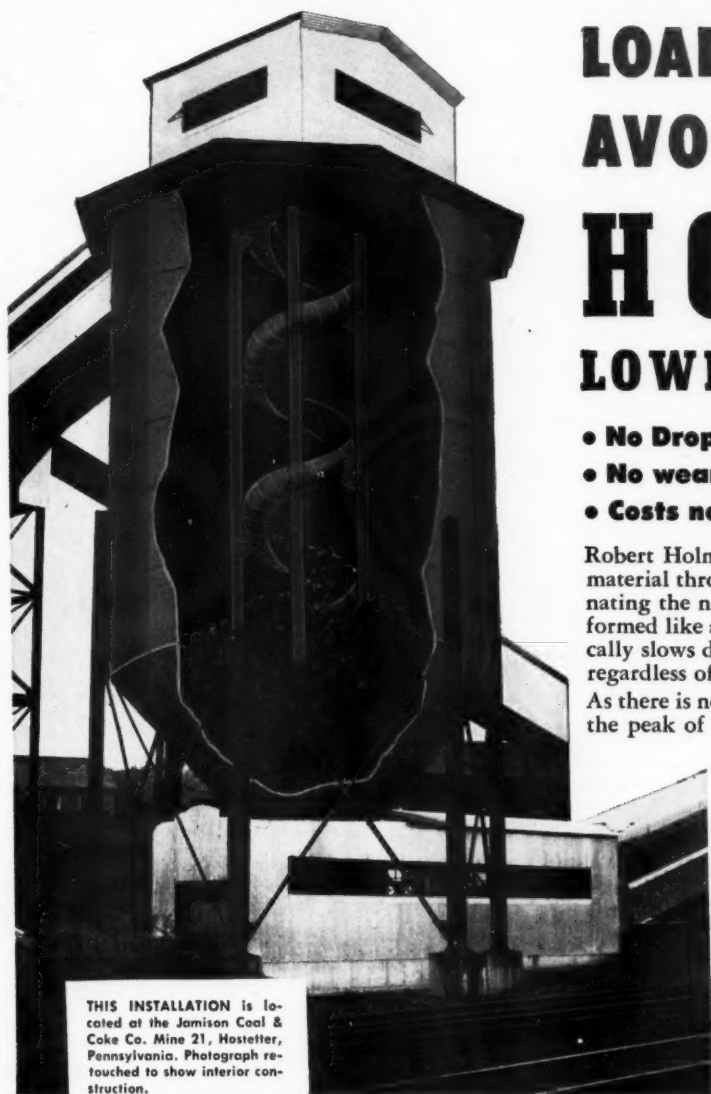
*"MS" Delay Electric Blasting Caps are available in 14 millisecond delay intervals: MS-25, -50, -75, -100, -125, -150, -175, -200, -250, -300, -350, -400, -450, -500.



**DU PONT
EXPLOSIVES**
Blasting Supplies and Accessories



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



THIS INSTALLATION is located at the Jamison Coal & Coke Co. Mine 21, Hostetter, Pennsylvania. Photograph retouched to show interior construction.

LOAD BINS FAST... AVOID BREAKAGE **HOLMES** LOWERING SPIRALS

- No Droppage to degrade your coal
- No wear and tear on bins
- Costs nothing to operate

Robert Holmes Lowering Spirals are designed to lower material through the use of centrifugal force, thus eliminating the need of an inside retaining lip. Each spiral is formed like a well-banked race track. The coal automatically slows down when it reaches the "safe" speed limit, regardless of the distance of travel.

As there is no retaining lip, the coal slides gently off onto the peak of the pile to form a natural angle of repose.

In this way, the coal is spread out uniformly... a real advantage where segregation is a problem.

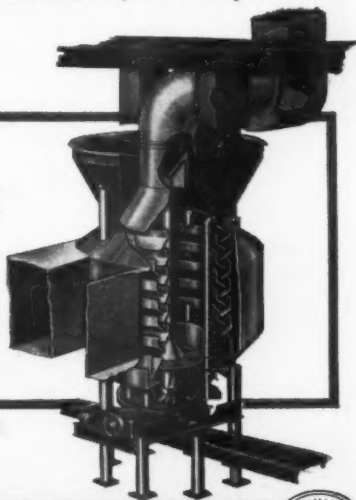
Lowering spirals are essential to proper handling in surge bins, run-of-mine storage bins and pockets, mine retail sales bins, and consumer storage systems.

*For Free Literature and
Complete Details, Write Dept. C-4*

CONTINUOUS-FLOW, ONE-PASS DRYING with *Baughman* VERTI-VANE THERMAL COAL DRYER

Both low in initial cost and operating cost... each Verti-Vane unit is designed for capacities from 15 to 75 tons. It handles all coal sizes from 1½" down. Reduces surface moisture to approximately 2% in a "one-pass" operation. Minimum of moving parts and slow-speed operation tend to eliminate shift breakdowns and lost time. Easily adjusted for feed conditions... requires little attention.

Write for Free Catalog No. 101 Today. Please address Dept. C-4



**Bigger tonnages per day through
continuous one-pass coal drying.**

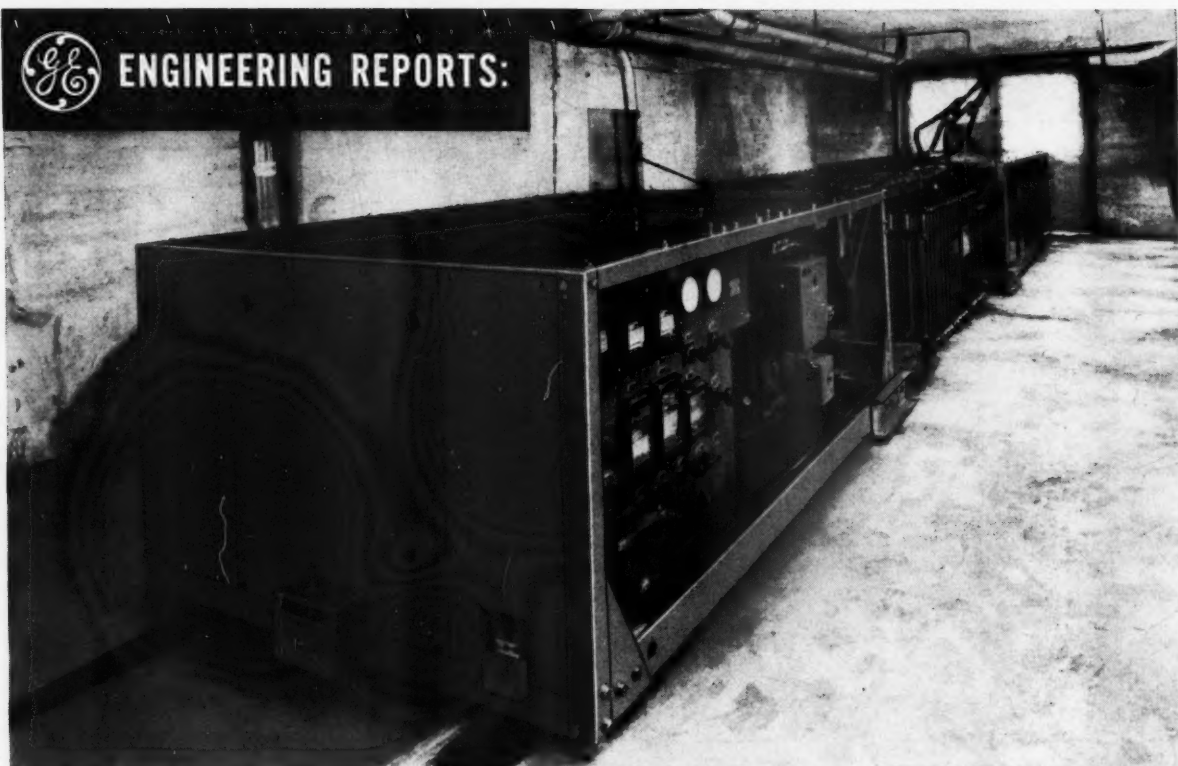
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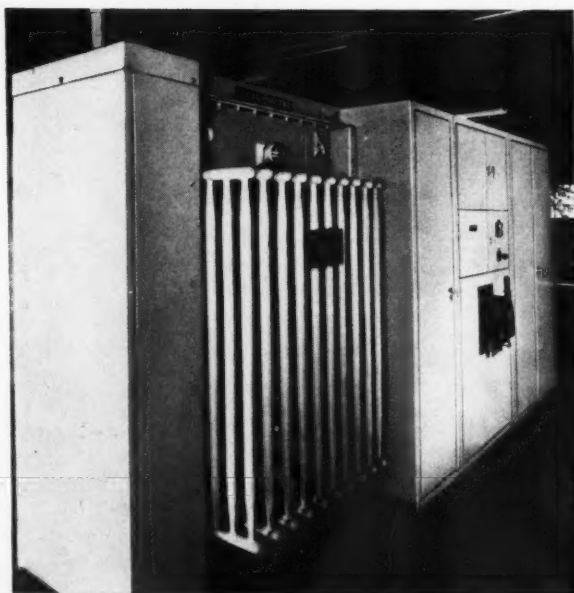
ENGINEERING REPORTS:



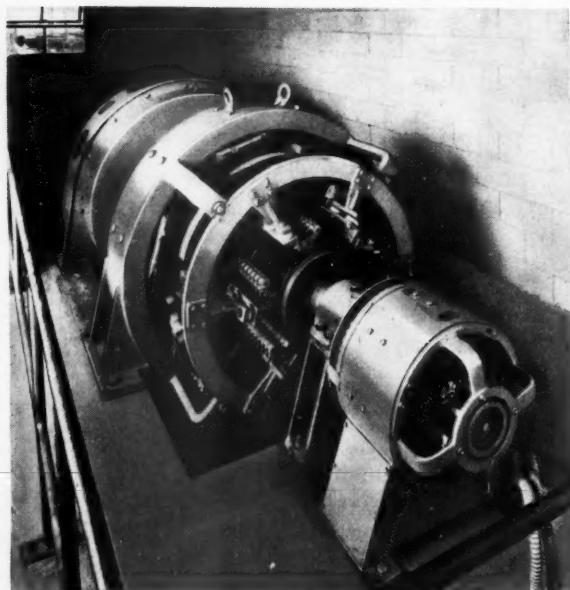
FULL VOLTAGE AT THE FACE is maintained at Crown Mine by this 300-kw G-E portable mining-type rectifier, to keep equip-

ment working at high efficiency. The fully integrated, automatic unit is enclosed to better protect personnel.

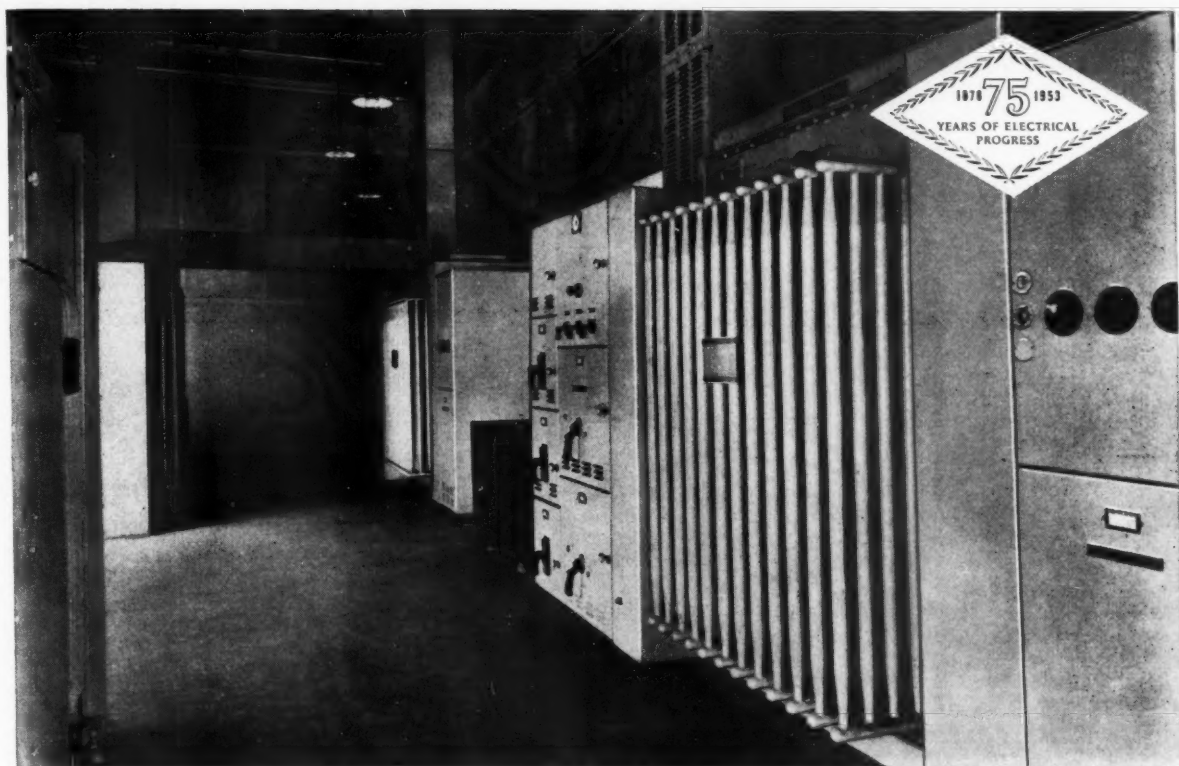
Engineered power system is key



STEP-DOWN TRANSFORMER and control, through which voltage is reduced to suitable levels for operating Crown Mine's auxiliary hoist, was engineered to meet mine's specific needs.



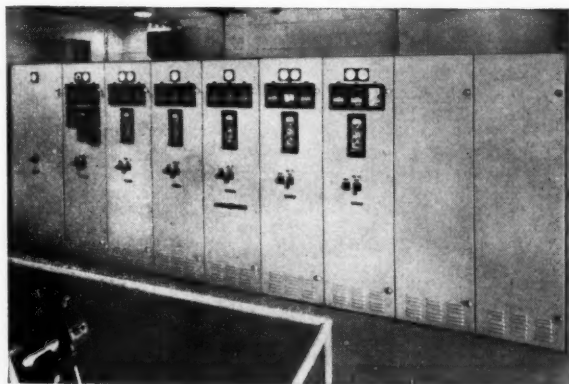
SYNCHRONOUS MOTOR-GENERATOR SET, rated 750 kw, supplies adjustable-voltage d-c power to motor driving the automatic main hoist. Set is controlled from plant's switchgear.



LESS VOLTAGE DROP takes place when plant voltage is stepped down close to points of use. These 4 G-E load-center unit

substations at Crown Mine (2 at left, 2 at right), reduce voltage from 4160 to 480 to feed plant motors.

to Crown Mine's 800-tph output



HIGH-VOLTAGE POWER is distributed through this metal-clad switchgear lineup, where various mine and plant functions are sectionalized so that service interruptions are at a minimum.

Co-ordinated G-E equipment provides high service continuity, minimizes shutdowns

Modern is the word for Freeman Coal Mining Corporation's new Crown Mine at Farmersville, Illinois, with a rated capacity of 10,000 tons per day of coal. And modern is the word for its power distribution system, engineered and equipped by General Electric to assure high service continuity, integration of underground and surface operations, and consistently high output.

Just as G-E engineers utilized every applicable technique to co-ordinate Crown Mine's electric equipment into an efficient, low-cost system, they can do the same for your mine. To find out how, contact your local G-E Apparatus Sales Office—soon. General Electric Company, Schenectady 5, N. Y.

663-30

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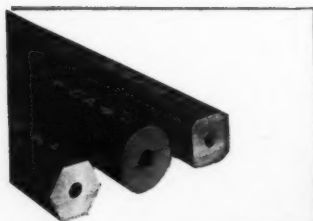
In rock-drilling operations, the blaster is a key man. He plans the blast, tells the drill-runners where to drill their holes, loads the charge for the greatest effectiveness.

He expects . . . and gets . . . peak efficiency from his men and the tools they use.

This is why Crucible Hollow Drill Rods rank first with crews supervised by top-notch blasters. Experience has shown them that Crucible rods stand the rapid-

fire battering of modern rock-drilling longer; give them the least breakage, the greatest service life.

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Editorials



JOHN C. FOX, Editor

JANUARY, 1953

Let's Keep the Record Straight

FROM UNITED MINE WORKERS JOURNAL,
DECEMBER 1952

American Mining Congress Looks Backward, Labor Policy Outdoes Even NAM-T-H Act

THE American Mining Congress, an association of coal and metal mining corporations, was established many years ago for the ostensible purpose of advancing mining techniques and promoting sound legislation and public policies in the interest of development of the nation's mineral resources. With that objective, the UMWA has no quarrel.

However, a recent policy statement adopted by the AMC departs radically from its proper sphere and plunges headlong into the field of labor-management relationships. Its statement on this subject is truly one of the most ill-considered and backward-looking documents ever perpetrated by any assembly of corporation lawyers. It even goes the NAM-Taft-Hartley Act one better by proposing repressive laws to straitjacket labor which even that vicious law eschewed.

The AMC advocates a ten-point amendment program of the NAM-Taft-Hartley Act calling for outlawing any form of union security, compulsory injunctions in national disputes, prohibition of industry-wide bargaining, rigid restraints on picketing, elimination of the Labor Department, and new legalistic red tape on the National Labor Relations Board, etc. Such a policy would turn the clock back with a vengeance.

Then, after deploring non-use of the T-H injunction proviso against the steel workers last summer, the AMC policy-framers cover up by some vague language calling for adherence to "sound fundamental principles" rather than "a bureaucratic or socialistic approach." Truly, all logic flew out the window when this document was penned!

If there is anything more bureaucratic than the NAM-T-H Act, which provides machinery for governmental interference with collective bargaining at every stage, we cannot conceive what it would be. And destruction of free labor unions and collective bargaining marks the crossroad leading toward the totalitarian state, whether it be called socialistic, communistic or fascist.

It is hard to believe that the practical men of the mining industry had any part in drawing up this completely reactionary labor policy statement. Certainly, the American Mining Congress has forfeited any right to confidence as an impartial agency devoted to scientific or technical progress so long as it permits this utterly prejudicial and regressive document to stand as an expression of its views. We suggest that responsible mining executives whose firms are affiliated with the AMC examine this statement and repudiate it.

FROM DECLARATION OF POLICY OF THE AMERICAN MINING CONGRESS, SEPTEMBER 1952.
APPROVED BY THE BOARD OF DIRECTORS,
DECEMBER, 1952

Labor Relations

ADHERENCE to sound fundamental principles is necessary to properly guide the national policy in social, political, economic and governmental matters. There is increasing evidence that such paramount and essential principles as non-dictatorial government, security of individual rights and protection of the public interest are being deliberately ignored in attempts to circumvent and weaken the Labor-Management Relations Act. Congress should re-assert and make fully effective those necessary principles by amending the Act to:

1. Prohibit compulsory unionism in any form;
2. Prohibit labor monopolies and industry-wide bargaining;
3. Uproot communistic influence from the internal affairs of unions;
4. Require the President, in the threatened national emergency strike or lockout situations, to utilize the provisions of the Act;
5. Prevent industrial sabotage;
6. Safeguard, from union encroachment, the functions of management and the rights of workers;
7. Effectively outlaw mass picketing, violence, intimidation and similar terroristic devices in labor disputes;
8. Require that decisions of the National Labor Relations Board be based upon preponderance of evidence;
9. Restore stability to labor agreements; and to
10. Create a department of Employer-Employee Relations in lieu of the Department of Labor.

The emasculation of the national emergency provisions of the Labor-Management Relations Act through administrative nonfeasance such as occurred during the recent steel crisis deserves severe censure. Measures designed to authorize plant seizure, to impose terms in labor agreements, or to compel arbitration by governmental agencies in labor disputes inevitably promote further domination of the public welfare by bureaucracy, and should be defeated.

Our problems will be solved by adherence to sound fundamental principles rather than through a bureaucratic or socialistic approach.



Mobility of trackless equipment is an aid to operations

Diesel-Powered Equipment Underground

When Used Correctly, Diesels Have Much to Offer
Metal Mining

By J. H. EAST, Jr.

Regional Director, Region IV
United States Bureau of Mines

THE use of diesel equipment underground is a controversial subject in this country, despite the successful utilization of this type of power for more than 10 years in some American noncoal mines.

In this article are outlined the conditions under which diesel-powered equipment can be used safely in underground noncoal mines. Coal mining conditions differ from those encountered in other mining and tunneling, particularly where explosive gases may be found and the use of diesels in coal mines should be discussed in a separate article.

Used for 30 Years

Diesel engines have been used in European underground mines for about 30 years. The author knows of no fatalities that have been attributed to toxic gases from Diesel engines or equipment. Moreover, so far as can be ascertained, no mine fires have been charged to such equipment. Experience proves conclusively that diesel-powered equipment can be used safely in underground mines if the equipment and conditions of use are properly designed and controlled.

Many people do not understand the difference between the exhaust of a diesel engine and that of a gasoline engine. This is the primary cause of much of the controversy. Gasoline-powered equipment should never be used underground. In fact, most states prohibit such use. A gasoline-engine exhaust may contain as much as 14 to 17 percent carbon monoxide. To operate efficiently, a gasoline engine must use a "lean mixture" of gasoline and air, which results in a high percentage of carbon monoxide. A diesel engine, on the other hand, must operate in an excess of air. Its exhaust should not contain more than 0.25 percent carbon monoxide, nor more than 0.075 percent oxides of nitrogen, and frequently the percentages are much lower.

To many people the mere mention of a diesel engine brings to mind a commonplace roadblock in the form of a diesel truck slowly laboring up a

hill ahead of their cars. Fumes and smoke from the truck engine cause them discomfort and strain their tempers. Such fumes and smoke do not exist when diesel-powered equipment is used underground under proper conditions. The air: fuel ratio for maximum efficiency in operating a truck on the highway is about 16 to 1. This means that the truck burns 16 lb of air with each pound of fuel. For diesels used underground, the U. S. Bureau of Mines has found that an air: fuel ratio of 20 to 1, that is, 20 lb of air for each pound of fuel consumed in normal air, limits the carbon monoxide in the exhaust to a practicable minimum. The full efficiency of the fuel is not realized, but lower power requirements for ventilation more than compensate for the added cost of fuel.

Altitude Affects Operation

A diesel engine's fuel-injection system should be adjusted to the altitude at which the engine is to operate. The weight of a given volume of air at sea level is much more than at an elevation of 10,000 ft. As the volume of the engine

cylinders remains constant, the quantity of fuel injected must be adjusted to maintain a suitable air:fuel ratio each time the equipment is moved to a different altitude. No attempt is ordinarily made to adjust the fuel-injection systems of cross-country trucks for changes in altitude. However, in some trucks, the drivers can and do adjust their fuel injection manually to obtain maximum power—and this, incidentally, contributes to the unpleasant odor that assails one when he follows a truck uphill. A smoky exhaust from a diesel engine used underground indicates that the air:fuel injection system may need adjustment.

Eliminate Toxic Gases

The exhaust gas of any diesel engine contains toxic gases. Even though they are present only in fractional amounts when compared with toxic gases found in a gasoline engine exhaust, these gases must be diluted and carried away if the equipment is to be used safely in underground mines or in confined spaces.

What are these toxic gases? The principal constituents of the exhaust gas from a diesel engine are carbon dioxide, carbon monoxide, oxygen, nitrogen, and oxides of nitrogen, with varying amounts of aldehydes. All of these gases are both colorless and odorless except the aldehydes. Aldehydes are not particularly dangerous, but they are objectionable. In any considerable amount, they are so irritating to the eyes, nose and throat that a worker would withdraw before any important physiological effects developed.

Carbon monoxide, oxides of nitrogen, and carbon dioxide in amount of about six percent or more are toxic gases and they must be considered



Diesel loading and haulage units in lead-zinc mine

when a diesel engine is to be used underground. Essentially, the precautions are simple. Foremost among them is provision of adequate ventilation to dilute and carry away the gases so that normal mine air may be maintained at all times. A diesel engine requires virtually normal air for efficient operation underground or in confined places. If the atmosphere contains one percent carbon dioxide, the engine will smoke and reduce visibility to a minimum. The Bureau of Mines recommends that mine air should contain at least 20 percent oxygen and not more than 0.5 percent carbon dioxide.

Carbon monoxide and oxides of nitrogen are dangerous unless diluted below the toxic limit. The United States Public Health Service has established permissible limits of:

100 parts per million for carbon monoxide and 25 parts per million for oxides of nitrogen, or 0.01 percent (by volume) carbon monoxide; 0.0025 percent (by volume) oxides of nitrogen.

To attain a safe working atmosphere sounds difficult, but it is not. The USBM has established that the calculated amount of ventilation required to dilute the exhaust of a specific diesel engine will provide a safe working atmosphere when multiplied by a safety factor of two in the case of metal and nonmetallic mines.

Often Need No More Air

A rule-of-thumb method frequently used to determine the ventilation requirement is to provide 75 cfm of normal air per brake horsepower of the diesel engine. For example, a 50-hp diesel engine would require approximately 50 x 75 cfm, or 3750 cfm. In most mines the air circulated exceeds the amount required to maintain normal-quality air, and additional ventilation may not be needed.

Various methods of diluting the engine exhaust are used. In Europe it is common practice to discharge the exhaust so that the engine fan will blow a mixture of exhaust gas and mine air through the radiator. It is claimed that this will dilute the exhaust as much as 10 to 1.

In the United States little work has been done on the dilution of the final exhaust. At several installations the undiluted final exhaust is discharged directly into the atmosphere. This is almost certain to arouse employee resistance. The use of conditioners for the exhaust will go far toward reducing the present opposition of the men toward the diesel.

Employees object to the odor of unconditioned exhaust, an odor caused entirely by the aldehydes present. An



Diesel-powered equipment finds use in scaling down loose rock in limestone mine

exhaust-gas conditioner or washer, properly designed, installed, and operated, will remove most of those aldehydes from the exhaust gas.

In Europe the exhaust washers, which are required in virtually every country, usually consist of a series of baffle plates in a water bath. Exhaust gas bubbling up through the water strikes against the baffles, which break up the bubbles and thus bring the gas into more intimate contact with the water. Although most of the aldehydes are removed, this method is not too satisfactory.

In this country few manufacturers make conditioners or washers except for use with their own engines.

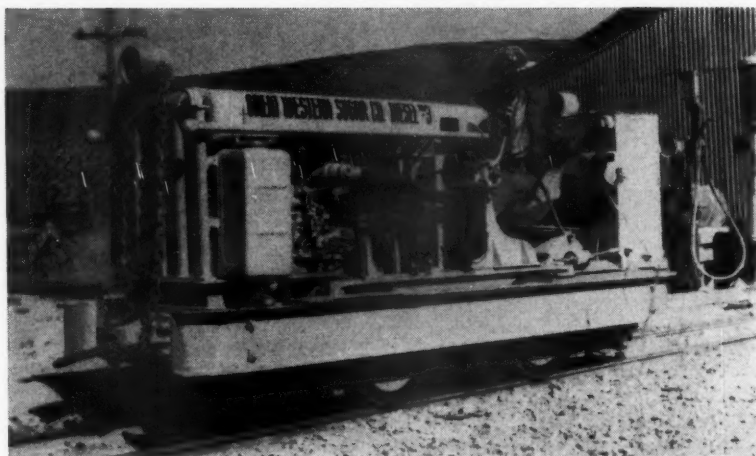
A conditioner should have enough capacity to prevent the water from becoming saturated with aldehydes in less than eight hours. The design should be such that the water will not be blown out when the engine is started or when it is working under full load, and the gas bubbles should be broken up by baffles or other means.

Work to Improve Scrubbers

Experiments have proved rather conclusively, however, that water used as a scrubbing medium will not remove the aldehydes completely. Neither will it remove the carbon monoxide and oxides of nitrogen; hence, these gases must be diluted with air.

The Bureau of Mines is developing a process for removing aldehydes by the use of sodium hyposulfite and hydroquinone. This process is reported satisfactory, but has not been perfected; it removes virtually all of the aldehydes for extended periods and can be employed economically in simple scrubbing equipment.

Even though aldehydes are not dangerous, they are a serious nuisance.



Track-mounted diesel locomotives have been successful at a number of operations

Before diesel haulage underground can become generally satisfactory, this aldehyde nuisance must be removed.

In mines and tunnels diesel locomotives have proved a very satisfactory means of haulage. Compared with trolley or storage battery locomotives of equal horsepower, diesel haulage is preferred by many users for two major reasons: (1) It is more flexible, and (2) operating costs are lower. However, because of ventilating requirements, diesel locomotives are limited to engines of lower horsepower than that attainable or required of trolley locomotives.

Operating Costs Are Low

A nonmetallic mine in a western State has been using diesel-powered, five-ton locomotives as main-line haulage units for about eight years. The ore is pulled from two parallel veins, and the average length of haul from each is 1.16 and 1.43 miles, respective-

ly. Two diesel locomotives last year hauled an average of 1102 tons daily to the crusher. The haulage cost, exclusive of the wages of the operator, was one cent per ton-mile. The fuel cost per ton-mile was \$0.0015, and the maintenance cost, including labor, was \$0.0085.

The question of storage battery versus diesel locomotives is frequently discussed. There is a definite field for both types of haulage units. Where track grade is fairly steep and the load heavy, the diesel has definite advantages. Principal among these is the elimination of the large battery charging stations necessary to service enough batteries.

Word of Caution

It should be reemphasized that diesel locomotives or engines should be confined to areas where ventilation is adequate. When they are to be used underground, several safety factors should be observed:



Scrubber on rear end of bulldozer used underground removes dangerous gases from exhaust passing through it

(1) State authorities should determine ventilation needs and check the quality of air both before and after diesel equipment is installed. The U. S. Bureau of Mines is always ready to assist in this work.

(2) State authorities should specifically designate where and under what conditions diesel equipment may be used.

(3) Normal-quality air should be maintained in the mine. This means that the oxygen content of the air should be not less than 20 percent, and the carbon dioxide should not exceed one-half of one percent.

(4) Exhaust gas from the diesel engine should be scrubbed effectively. The conditioner should be of a type that will not permit the water to be blown out on starting or under heavy load; its water capacity should be large enough to last at least one shift without saturation; and the water should be drained at least once each shift.

(5) The diesel engine should be maintained in good operating condition through periodic overhauls as

recommended by the manufacturer and government agencies. It is better to establish the time of overhaul by the number of hours in operation, following the usual practice of contractors using diesel equipment.

(6) A diesel engine should be properly adjusted and regulated, both for altitude and for use underground. The air fuel ratio should be maintained at a suitable level and the adjusting mechanism should be sealed to prevent tampering or unauthorized readjustment.

Diesel-powered equipment has a place in underground mining but should be used only where there is enough ventilating air to dilute and carry away exhaust gases.

The use of diesel-powered equipment in underground mining will continue to increase as the industry learns more about its efficiency, mobility, and safety. Ways will be found to utilize diesel power in many more types of equipment than at present. Employee opposition to diesels underground will be reduced when more people have the opportunity to see them operating under recommended conditions.

—Discussion—

Diesel Locomotives at Idarado

By JOHN S. WISE

General Manager
Idarado Mining Co.

EARLY in 1945, Idarado acquired its first diesel-powered locomotive—a 5-ton Ruth Dieselmule equipped with a 4-cylinder, 4-cycle Buda engine. The compelling reasons for trying such a relative innovation underground included:

(1) An unusually long haulage distance and a track grade of such extreme variation and condition that it seemed imperative to use equipment other than storage battery locomotives.

(2) A lack of clearance in the Treasury Tunnel for trolley equipment, the installation of which would have called for a sacrifice of desired safety standards and a large capital expenditure.

(3) A knowledge of the successful application of a diesel locomotive in the driving of the Treasury Tunnel extension under government-sponsored contract in the years 1943 and 1944.

Our experience with the Ruth locomotive served to point up the inherent advantages that we initially felt existed in diesel-powered equipment, leading us to further continue our experimentation.

In late 1947, we purchased an 8-ton Plymouth locomotive, equipped with a

Hercules DRXC 6-cylinder, 4-cycle engine rated 73 HP at sea level at 1000 rpm engine governed speed. To date this locomotive has hauled over a 1,000,000 tons of ore to the mill, for a total of 2,200,000 one-way ton-miles. Throughout this period we have diligently observed the Plymouth's performance, seeking ways and means to improve exhaust conditions, trying to determine what could be done to derive a better over-all operating unit.

Experience thus gained prompted investigation of two-cycle diesel engines and torque converters. An experimental model was so satisfactory that recently a production model was purchased for further experiment. At this time its performance is very encouraging and augurs well for the future.

There are several pertinent thoughts relative to two-cycle diesel engines which, in the light of current knowledge, should be expressed to clear up possible misconceptions:

(1) The general idea that an air: fuel ratio of 20 to 1 is minimal deserves a few words of explanation. The range of most efficient clean combustion is obtained when the air: fuel ratio is 30 to 1 or higher. Maximum

power with fair combustion characteristics is obtained at ratios of 20 to 30 parts of air to 1 of fuel. Below a 20 to 1 ratio, combustion efficiency is poor and there is a noticeable loss of power. Studies and tests with scavenger blower show that these ranges of air: fuel ratio are practically independent of engine speed. The ratio at which exhaust smoke becomes minimal varies from 27 to 1 at 2000 rpm to 30 to 1 at 800 rpm.

(2) When operated at substantially constant air: fuel ratio, performance as to power and mixture varies directly as the air density. Higher elevations produce too rich a mixture and a loss of power when sea level jets are used. In the case of a two-cycle diesel engine, however, there is a considerable range of altitude where the power changes but slightly as the air density decreases. With scavenging, combustion efficiency approaches independence of air density.

(3) Studies of diesel engines at Idarado have shown that the power output characteristics are relatively insensitive to changes throughout a wide range of altitude, yet do become increasingly touchy as the air: fuel ratio approaches or exceeds the exhaust smoke limit and as the engine approaches peak power. With this in mind, it appears most prudent, when choosing a diesel unit for underground operation, to select a larger engine than the haulage requirements might call for.

(4) In the early phases of Idarado's two-cycle diesel operations, the engines were adjusted as follows: Using 70 cu mm unit injectors, the load limit screw on the injector control tube was set to produce a 31 to 1 air: fuel ratio. The maximum fuel injection per cycle was about 47 cu mm, producing a maximum engine speed of 1350 rpm, and yielding a maximum brake horsepower of 83. They have since changed from 70 to 55 cu mm injectors, and have re-set the load limit screw which restricts the engine speed to 1200 rpm and in addition, advance timing the 55 injectors by using a 70 injector timing pin deserves some comment:

(a) Engine horsepower output has remained substantially the same with 55 versus 70 injectors.

(b) By advance timing the 55 injectors, fuel is injected into the cylinders a little earlier, thus allowing more time for the fuel to burn. A marked improvement in exhaust conditions has thus been established; there is little or no smoke throughout the operating load range, and aldehydes are at a minimum level.

Idarado has found singular advantages in diesel locomotive operation—namely, wide flexibility, greater safety, excellent tractive effort over difficult grades, simplicity, self-containment, and economy in operating as well as maintenance costs. The use

of diesels underground does require an adequate ventilation system, yet when one considers this phase, it is probably only fair to state that most mines could stand to be better ventilated with or without diesels. Principal efforts at Idarado in the diesel field have been directed toward improving the engine exhaust by meticulously setting the valves and unit injectors. The inherent problems of a safe and clean exhaust can best be met by control at the source—namely the engine itself—rather than beyond the

exhaust manifold. It is recognized that conditioning of the diesel exhaust is important and serves a very necessary purpose. Yet, if a diesel engine is operating at peak efficiency the type and mode of conditioning assumes a secondary role. It would seem only rational to expect intelligent effort to be directed engine-wise first and conditioning second. Such a program will afford to the mining industry a remarkably successful tool, a tool that only a few have attempted to utilize to the full in this country.

cause of corrosion. Tests showed the absorption of the exhaust gas components made the water in the conditioner highly acid. The water tested as low as 3.4 pH. Later a screen was installed in the conditioner on which was placed two or three layers of rubble limestone which reduced acidity to about 6.5 to 7.0 pH. This limestone scrubber has also been effective in helping retain the water in the conditioner. Now, as an added precaution against corrosion, all conditioners are constructed of stainless steel. The exhaust discharge pipe from the conditioner is equipped with a venturi jet diffuser as well.

Ventilation in the haulage drifts and stopes is very good. In Wyoming, 6000 cfm is the minimum air requirement and in tests in the main drifts, the flow of air recorded is 30,000 cfm at a time when the 50,000 cfm forced draft fans are shut down.

Distance and tonnage requirements have made it necessary to purchase additional new cars and increase our trains from six to nine cars. The new cars are steel, Granby type, five-ton capacity; when empty, they weigh about 6600 lb each. By 1953, all the wooden cars will have been replaced by these steel cars.

In contrast with the haulage requirements of 1942, when the average trip was about 5400 ft, a production of 168 mine cars per day was required; now the average trip is about 7800 ft and 238 mine cars are required per day. The greatest daily tonnage yet produced is 306 cars or 34 trips in one eight-hr shift using two locomotives. The average load per mine car is 4.2 tons.

Diesel Locomotives Underground in Wyoming

By J. L. FELLOWS

Engineer, Limestone Department
Great Western Sugar Co.

AT Horse Creek, Wyo., The Great Western Sugar Co. mine produces 200,000 to 250,000 mine-run tons of limestone per year.

There are two strata of high quality limestone lying about 200 ft apart. These strata strike about N.20W. and the dip varies from 65° to 80°. The main adit is about 900 ft long to the nearest vein. In the main adit, which is 8 by 10 ft in cross-section, there is a single 45-lb, 24-in. gauge track. In the two main drifts, which are 8 by 14 ft, there are two tracks, each of 30-lb rail. One is the loading track which runs under the loading chutes. The other is the main line haulage track. The two are interconnected with switches about every 280 ft.

In 1942, the first diesel locomotive was purchased. This was a three-ton unit powered by a 50-hp BudaLanova engine. In 1942, the average trip was approximately 2700 ft each way and the train consisted of six 5-ton wooden cars. These cars weighed approximately 5400 lb empty. Twenty-eight trips were required in one eight-hr shift. Grade is in favor of the loaded portion of the trip. This locomotive was equipped with exhaust gas conditioner, front and rear headlights, and all other appurtenances.

By 1948, the haulage distance had increased appreciably, and it became necessary to purchase another locomotive. This unit is a five-ton diesel similar in construction to the three-ton unit except that the main drive shaft design was revised to include a fluid coupling between the engine and the transmission. When the second diesel was delivered, a locomotive was assigned to each drift.

In 1949, it was decided to push the development of the drifts. To facili-

tate this work, another five-ton diesel locomotive was purchased in 1950. A fourth unit is on order at the present time. The delivery of the fourth locomotive will provide an extra unit which will take care of servicing and maintenance schedules and provide a spare locomotive in case of emergency.

All locomotives are equipped with "Ruth" exhaust gas conditioners to eliminate aldehydes and noxious fumes from the exhaust. There have never been any complaints of odors or gases underground. The first conditioners installed were of mild steel, but these had to be replaced periodically be-

Use of Diesel Equipment In a Zinc-Lead Mine

By V. C. ALLEN

Assistant Manager
Tri-State Zinc, Inc.

WE all know the merits of surface truck haulage from a limited area, particularly when there are a number of widely scattered loading points within the area. Underground diesel trucks, like surface trucks, have the same advantages provided the mine has ample ventilation to operate the diesel engines and enough room to maneuver the trucks with a minimum loss of time.

The Bautsch Mine of Tri-State Zinc, Inc., located near Galena, Ill., is a mine well adapted for diesel truck haulage. It is a flat lying zinc and lead deposit averaging some 200 ft wide, 60 ft high and has a compara-

tively level floor. Mining is done by the room and pillar method.

This mine was originally opened by two vertical shafts approximately 300 ft deep; the No. 1 shaft was used as a hoisting shaft and the No. 2 shaft some 350 ft to the south was a ventilation shaft. Later a 1700-ft inclined adit on a 10 percent slope was put in for diesel truck haulage from the mine stope direct to the mill crushing plant.

A 24,000-cfm blower forces fresh air down the No. 2 shaft and with four small blowers located on churn drill holes leading into exploration or dead

(Continued on page 49)



It takes know-how and big equipment to handle hardwood logs on The New River Co. tree farm

Appalachian Coal Companies Grow Timber as a Crop

**From Doubt to Enthusiastic Acceptance—This is Story
of Tree Farming in the Coal Fields of West Virginia,
Eastern Kentucky and Ohio**

By **BEN RHODES**
American Forest Products Industries

THE mine operator listened.

The forester insisted: "Mine props sawed from hollow cull beech will not shear. The interlocking grain makes the wood too tough."

"But what about strength," the operator asked.

"Beech has that, too," and the forester produced test data from the Forest Products Research Laboratory showing beech compares favorably in strength with white oak.

"All right, but what about its durability? It rots fast, doesn't it?" insisted the mine executive.

"It won't resist rot as well as oak and locust," the forester admitted, "but, it will last long enough to use where you need support only a short time. Give it a try."

A. S. Wilson, vice-president of Boone County Coal Corp. at Sharples, W. Va., listened to this argument for beech mine props five years ago. It began when the operator asked the newly hired forester what he could do with beech wood.

"Good quality beech can be sawed into commercial lumber," was the suggestion. "The culls will make props."

Despite some opposition it was decided to experiment with sawed beech wood props. The trial was a success. Boone County Coal Corp. now uses thousands of sawed beech props each year. This one development has saved the company many young, thrifty trees that would otherwise have been cut. And it also has provided a use for trees and parts of trees once left in

the woods to rot or interfere with the growth of more valuable timber.

A few years ago this company, like many others in the nation's major coal regions, thought it had to have oak, black locust and chestnut props exclusively.

Today, Boone County Coal Corp. takes the view that virtually every species growing on its 23,000-acre Tree Farm is useful. Beech and black gum are prime examples. No longer scorned, they are used extensively, raw or treated, in ties, headers, props, wedges, and as an important specialty item in roof bolting.

Used in Roof Bolting Too

After some roof failures between bolts, the engineering department decided a collar or washer larger than conventional six-in.-square steel plate was needed. The engineers asked for some good oak 2½ by 10 by 22 in. "Oak will split when you tighten the bolt," the forester warned. "Why don't you try beech?"

The engineers held out for oak, so oak it was—and it did split. "OK," they said. "Get us some beech washers."

Now, both beech and black gum washers are used regularly. These are preservative-treated when used on the main line and in other permanent installations.

To get the most out of its timber supply, the Boone County Coal Corp. found it worthwhile to put two carefully trained full-time men in charge of their timber yard. These men know what kind of wood is required for each particular section and whether it should be treated or untreated.

The coal company's Tree Farm yields nearly two million fbm of timbers, props and lumber a year. This harvest supplies all the wood needed in the mines and maintains company buildings as well. Since the cut is less than the Tree Farm's annual growth, a wood reserve is accumulating against emergencies or for eventful commercial development.

No Longer a Theory

This Boone County Coal Corp. forestry story illustrates a basic change in thinking among coal operators and executives from southeastern Ohio across West Virginia into Kentucky and Virginia. Wise timberland management as an integral part of coal mining is no longer a forester's theory. It is an accepted fact with firms like New York Coal Sales Co. and Sunday Creek Coal Co. in Ohio; The New River Co., Olga Coal Co., and New River & Pocahontas Consolidated Coal Co. in West Virginia.

These operators and their forest managers see continuing crops of timber for mining needs and for commercial hardwood markets, resulting from



"Everything but the squeal" is used by mining companies in Ohio

improved tree farming practices now under way. The trend is toward better utilization of "weed" species, elimination of logging and sawmill leftovers and improved cutting practices on coal company controlled woodland in the Appalachian area.

Reclaim Burned Over Areas

To see what this means in practice, let's take a quick look at the area around McArthur, Ohio. There last August the first coal lands in the Ohio Tree Farm System were certified. Some 17,000 acres of New York Coal Sales Co., and 24,000 acres of Sunday

Creek Coal Co., lands were dedicated as part of the 61,752-acre Tree Farm under intensive management by the Baker Wood Preserving Co.

Four full-time foresters manage the Tree Farm. Their work is described by Baker Wood Preserving Co.'s vice-president, J. Clyde English, as direction of "big scale improvement cutting operations" to up-grade stands already returned to "fair condition" by nature.

Much of the land has been burned over repeatedly in past years. Some of it was clear-cut for charcoal wood. As a result, today's timber stands are



Wooden washers for roof bolts solved a problem at Boone County Coal Corp. mine, Sharples, W. Va.



Short-life mine props are cut from hollow beech logs, formerly wasted, at Boone County Coal Corp.



Field demonstrations in practical forestry have done much to improve standards of woodland management in coal country

over-stocked with inferior species and fire damaged trees. The efficiency of the company's McArthur plant minimizes these problems.

Low grade logs are sawed into mine and car wedges, surveyor stakes, tie plugs and blocks. Leftovers are chipped and hauled away to nearby paper mills. Sawdust is used to fuel the power plant. Even the bark has a commercial use. It is sold as a soil conditioner or is used as litter for brooder houses on poultry farms. Better grades of logs go into lumber, crossties or timbers. This ability to convert trees into useful products carries the promise that these Ohio forest stands eventually will regain high quality.

Reforest Strip Lands

A reforestation program for strip mine reclamation is now under way. Finally, the company's four foresters have set up a continuous inventory system to maintain a careful check on growth rates under varying conditions. Today they can compute the timber volume on any given area.

Within the last decade many Appalachian region coal operators have accepted forest management as necessities. In 1945 the Appalachian Hardwood Manufacturers, Inc. (AHMI), established a forestry division and hired a forester to manage it. Owners of coal-bearing lands are the chief supporters of AHMI's program of forestry education and demonstration. Coal land members of the association's forestry division are the bone and most of the sinew of West Virginia's Tree Farm program established in 1948. Today the state has more than 150,000 acres dedicated to growing continuous crops of trees.

One aspect of the new view is that mining operators and their foresters

have seen the need for practical experimental work in tree growing and harvesting. They need it, as do the contract loggers that harvest wood for the mines. One of several companies that have moved in this direction is New River & Pocahontas Consolidated Coal Co. which maintains a 30-acre experimental and demonstration forest as part of its 1430-acre Tree Farm in Fayette County, W. Va.

Ralph Kemper, the company forester, and Howard D. Bennett, forester for AHMI, conceived the idea for an experimental plot. In 1948 the two foresters conducted a public tour and demonstration on the Fayette County property. They divided the plot into six cutting areas according to timber type and condition. Their first experimental harvest yielded approximately 6500 board feet of sawed materials and 70 three-ft props per acre. Most of the props were salvaged from tops of trees cut for sawtimber. The vigorous stand that remained measured nearly 3000 board feet per acre.

Forester Kemper is now collecting and recording growth data to evaluate effects of the 1948 harvest. Preliminary estimates indicate cutting the mature overstory increased growth rate on the 30 acres by 60 percent or more. Foresters predict this accelerated rate will continue during the 20-year cutting cycle to make another full harvest possible by 1967-68. Growth data will be recorded at five-year intervals. This continuing forest growth study will benefit other mine operators, industrial landowners, logging contractors and farmers in the area. Early in 1953 the foresters will invite the public to visit the experimental forest to see and study growth changes that have occurred in the first five years.

First Tree Farm in West Virginia was the 42,000-acre New River Co. tract near Mt. Hope, dedicated early

in 1948. The company in recent years has planted evergreen trees on 700 acres of idle agricultural land, and trees and legumes on 400 acres of strip mine spoil. The spoil bank plantings were experimental in nature.

Although The New River Co. does not employ a forester, it is an active member of AHMI. The company's timber manager calls on the association for forest management advice and help in the woods. High cutting standards prevail on New River woodlands. Minimum diameter limits range from 22-in. and up on better trees down to 12-in. on less desirable timber.

An annual harvest of about 3,000,000 fbm is taken from an estimated annual growth of 6,000,000 or more. About one-sixth of the cut is high quality timber. This goes to commercial operators for processing into lumber, veneer and other specialties. The remainder of the cut is sawed by three contract mills on the property into mine materials and lumber for company use and commercial markets.

Most every species has its use, and as much as possible is obtained from every tree harvested. By installing 200,000 fbm of preservative-treated timbers in long-life installations each year the company is reducing consumption of wood per ton of coal mined.

Tree Farm a Game Preserve

Olga Coal Co. owns a 28,777-acre Tree Farm in the Pocahontas Field at Coalwood. Olga took over this property in December 1947 after it had been held for years as a game preserve with no timber cutting permitted.

After looking at figures of a timber survey made by the former owner in 1945, Olga's general superintendent and forester decided the area could be a producing forest and a game pre-

serve, too. The survey showed a saw-timber stand of 69,900,000 fbm on 11,447 acres. The remaining 17,330 acres had a stand of 33,000,000 fbm of immature timber that will be ready to log by the time all mature stands on the Tree Farm are harvested.

The first cut, recommended by the forester was 861,000 fbm of white oak, poplar, basswood, sugar maple and black walnut, most of which went into veneer, furniture and staves. After five years of cutting operations the deer herd and other game are believed to be on the increase. Deer are seen frequently in the company's prop yard.

Since 1949 a contract logger has been working on the property. The sustained yield of 3,250,000 fbm a year is converted into lumber and timber needed by the two mines and two villages. The company's own planing mill processes 500,000 fbm annually in flooring, trim, sash, siding and the other wood products to maintain 1000 company houses and other buildings.

Fire Protection Intensive

Fire protection on Olga Coal Co. property is perhaps the most intensive in West Virginia. During danger periods three company-owned observation towers are manned. Constant contact is maintained with the forester by two-way radio. The trained fire crews are Olga Co. employees. With this forest protection organization little, if any, help is needed from the state fire control group.

Fires remain the Appalachian re-

gion's number one problem and coal companies have been in the van of the forest fire protection movement in West Virginia for 40 years. The West Virginia Forest Fire Protective Association, formed by the merger of two groups that predated the state government's acceptance of responsibility for fire control, gets its principal support from coal land owners. The association now has a cooperative agreement with the State Division of Forestry in protection efforts.

During the disastrous October fire season in 1952 many coal companies were represented in both the organized and hastily gathered volunteer crews that fought Appalachian blazes. Harold Newland, Kentucky state forester, had high praise for the forest fire fighting assistance supplied by Harlan County coal operators. The Conservation Commission of West Virginia commended a number of companies for releasing men to fight fires.

The 1952 fall burn in West Virginia was estimated at from 600,000 to 1,000,000 acres—between six and ten percent of the state's forest total. Coal company foresters and managers were already planning with the West Virginia Forest Council to intensify the Keep Green fire prevention education campaign at the local level in traditionally "hot spots" even before disaster struck.

Coal men are showing collective interest in timber resources in other ways, too. The Ohio Reclamation Assn. of strip mine operators planted 3,000,000 trees in 1952 when 93 of its

110 members reclaimed spoil banks. Since 1945, this voluntary organization of mine operators has reclaimed more than 16,000 acres of forests.

Support Research

When potential danger in the "oak wilt" disease was shown to coal company leaders by a West Virginia University scientist and H. D. Bennett, the AHMI forester, a coal land executive led a cooperative team to meet the threat. R. E. Johnson, of Federal Coal Co., Charleston, W. Va., headed the committee that raised a \$7570 research fund for West Virginia University. This fund made it possible for university scientists to start research early in 1952 without having to wait for appropriations by the state legislature.

The seven coal operators associations in southern West Virginia contributed \$2000 to the oak wilt research program. The West Virginia Railroad Assn. and the West Virginia Forest Fire Protective Assn. gave like amounts. AHMI lumber members added the rest, although they had already given \$5000 to the National Oak Wilt Research Committee.

Timber has become a crop in the coal fields of the Appalachians. Land owners, primarily concerned with the economic potential of the coal below the ground, now see the full value of the self-renewing forests growing on the surface. Forestry is coming of age in West Virginia, Eastern Kentucky and Ohio.



A new crop of yellow poplars thrives after New River and Pocahontas Coal Co. timber harvest near Oak Hill, W. Va.



Posters, in Island Creek Coal Co. forest, instruct woods workers in correct logging techniques



Mill in Humboldt County, Nev., originally built for gold ore now handles 35 tons per hour of scheelite ore

Milling Tungsten Ores At the Getchell Mine

**Acid Leach to Remove Impurities Helps Convert
Scheelite Concentrate to Acceptable Product**

By **KEITH KUNZE**

Mill Superintendent
Getchell Mine, Inc.

THE start of the Korean war pointed up the critical shortage of tungsten available to the Free World. The main world source (China) was lost to us at a time when there was a great increase in the demand by both civilian and military users of the metal. At that time there developed within the government agencies responsible for tungsten procurement, two schools of thought as to the best way to increase domestic production. One school, exemplified by OPS and GSA favored a program similar to that in effect during World War II. This entailed a selective price incentive system; the establishment of Government ore buying depots; and Government operation of concentrate processing plants. The opposing government group, headed by DMPA advocated a guaranteed high price applicable to all production, with rigid specifications on the concentrates. Concentrating and refining of the ores was left to the individual producer. The DMPA policy prevailed, with the result that in Spring of 1951 the government set a ceiling of \$65.00 and a floor price of \$63.00 per Short Ton Unit of WO_3 in tungsten concentrates; and guaranteed this price for five years or until 1,500,000 STU had been pur-

chased, which ever came first. This was later amended to 3,000,000 STU.

Prior to the Korean incident, the price quoted on domestic tungsten concentrates was \$28.50 per STU of WO_3 . The quoted price rose rapidly in the latter part of 1950 and on January 26, 1951, the price was frozen at what eventually was to be \$65.00 per STU. This price, plus the floor price of \$63.00 per STU and the five-year program imparted a measure of stability to the domestic industry not heretofore enjoyed, even during World War II, and resulted in a tremendous expansion in domestic production. This expansion has been along three lines, (1) increased production from the few old established domestic producers, (2) re-opening of new mines and construction of new mills, and (3) the conversion of existing mills, particularly gold mills, to the recovery of tungsten minerals.

To understand the problems of milling tungsten ores it is necessary to review the specifications for tungsten concentrates set up by both the users of tungsten concentrates and by the Government program under the DMPA.

Few, if any, of the low grade domestic tungsten ores can be con-

centrated without also concentrating several of the above impurities over allowable limits in the concentrates. The result is that most operators must sacrifice a substantial percentage of economic return by either: (1) scalping out a high grade concentrate and sacrificing percentage of recovery, or (2) selling all or a portion of their concentrate to one of two plants in the United States equipped to chemically up-grade the concentrate and remove the impurities. If the operator is to avoid this sacrifice, he must establish a satisfactory technique and install necessary equipment at his concentrating plant to treat the concentrates so that a high percentage of recovery can be up-graded into an acceptable product.

Gravity Methods Standard

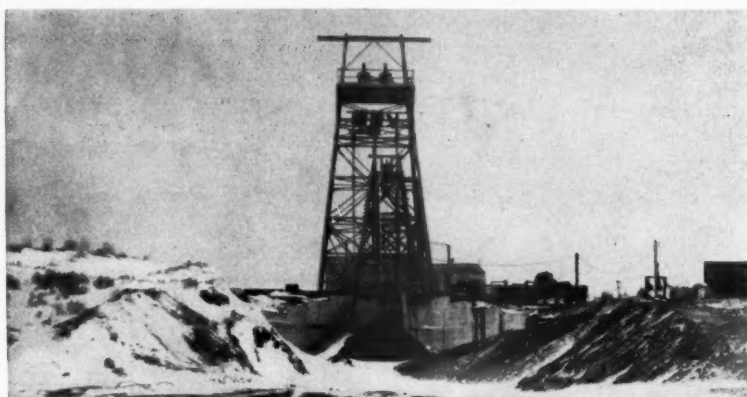
Historically, tungsten ores have been concentrated by simple gravity methods. Gravity concentration has the advantage of producing a high grade concentrate, relatively free from impurities, but returns a low percentage of recovery in most tungsten ores. The adaptation of flotation as an adjunct to, or a replacement of, other concentrating methods has only taken place in the last 15 years. Though great strides have been made in the flotation of tungsten ores, few of the low grade, disseminated domestic ores can be selectively concentrated to acceptable grades by flotation alone. A supplementary chemical treatment is necessary to eliminate the impurities.

Tungsten minerals occur in a great variety of ores, with the result that it is difficult to point to any one method of beneficiation as standard practice. Generally it is necessary to work out a milling procedure best suited to the particular ore to be treated.

Practice at the Getchell Mill, successful with a variety of ores mined within a 200-mile radius in Humboldt County, Nev., is not necessarily adaptable to all scheelite ores. Getchell's methods are cited only as an example of adapting existing milling equipment to the recovery of scheelite and establishing milling procedures which will turn a maximum percentage of recovery into a government acceptable concentrate.

Getchell Mill Treatment

The Getchell Mill, designed to treat oxide and sulphide gold ores was a typical sand-slime cyanide plant. It was extensively remodeled in 1947 to treat refractory ores found about that time. Additions to the mill in 1947 included conditioners and a sulphide flotation circuit. Gold milling was suspended in December, 1951, and a section of the flotation circuit was converted to the treatment of scheelite



Ore for the Getchell Mill comes from six company deposits and custom shippers within 200 mile radius

Additional Oleic Acid and D-40 are stage fed to the flotation cells as needed.

Additional Sodium Silicate, Que-

bracho and D-40 are fed to a four by four-ft conditioner ahead of the final cleaner cell, as needed.

Departure from the usual scheelite flotation practice is in the absence of a sulphide flotation circuit ahead of the scheelite circuit. The sulphides are removed in the acid treatment plant.

Operators Adjust Reagents

A wide range in amounts of all reagents fed is practiced at Getchell. The adjustments are made by the operators depending on indications on the tail and concentrate tables and on the froth condition. Range in amounts fed is frequently several hundred percent on all reagents during the course of a day. This is made necessary by

Reagents	Lbs per ton of feed	Place of introduction
Soda ash	5 to 18	Rod Mill
Quebracho	.15 to .25	Rod Mill
Sodium silicate	2.5 to 4.0	Rod Mill
Oleic acid	0.20 to 0.60	Classifier Overflow
D-40 (detergent)	.15 to .30	Head of Flotation

SCREEN ANALYSIS OF FLOTATION TAILS

Mesh	Percent Weight distribution	Percent Distribution, WO ₃
+ 65	13.50	3.83
- 65+100	18.98	7.15
-100+200	25.32	21.46
-200	42.20	67.56
	100.00	100.00

ores. The conversion required one week and was effected with very little change in or addition to existing equipment. Later the gold refinery was converted to a scheelite acid treatment plant. The integrated operation is currently converting a high percentage of recovery into Government acceptable tungsten concentrates.

Ore is truck hauled from six different company deposits and from numerous custom shippers. Ore generally occurs in tungsten bearing tacites from the contact metamorphic deposits. Identified minerals in the ore are scheelite, powellite, apatite, garnet, epidote, calcite, pyrite, molybdenite, chalcopryrite, quartz and graphite.

Grinding is done in an eight by twelve-ft rod mill and a six by eight ft ball mill at the rate of 35 tph. Classifier overflow is pumped to four conditioning tanks. After 30 min contact time, they are pumped thence to eight 66-in. Fagergren Flotation Cells. The concentrate is re-cleaned three times in 24-in. Denver Cells. The final recleaner concentrate is stored in a 44-ft thickener and pumped to a batch acid leaching plant as needed. Reagents are fed as shown above.

DMPA SPECIFICATIONS AND PENALTIES

Percentage of tungsten trioxide required	Percent Ferberite	Percent Hubnerite	Percent Wolframite	Percent Scheelite and Artificial Scheelite
Standard	60	60	65	60
Minimum	55	55	60	55
Maximum allowances of impurities:				
Tin	0.20	0.25	1.50	0.10
Copper	0.10	0.10	0.05	0.05
Arsenic	0.15	0.10	0.25	0.10
Antimony	0.10	0.10	0.10	0.10
Molybdenum	0.40	0.40	0.40	0.40*
Phosphorus	0.07	0.05	0.05	0.05
Sulphur	0.50	0.50	0.50	0.50
Manganese	1.00	†	†	1.00
Lead	0.20	0.20	0.20	0.10
Zinc	0.10	0.10	0.10	0.10

* Amended to 2.75 percent in December, 1951.

† Not specified.

Penalties:

(1) Deduct twenty cents (\$0.20) per STU for each one percent of WO₃ below standard requirements (60 percent). No concentrate accepted below minimum (55 percent).

Percent
0.01 Copper
0.01 Phosphorus
0.10 Arsenic
0.50 Bismuth
0.10 Molybdenum

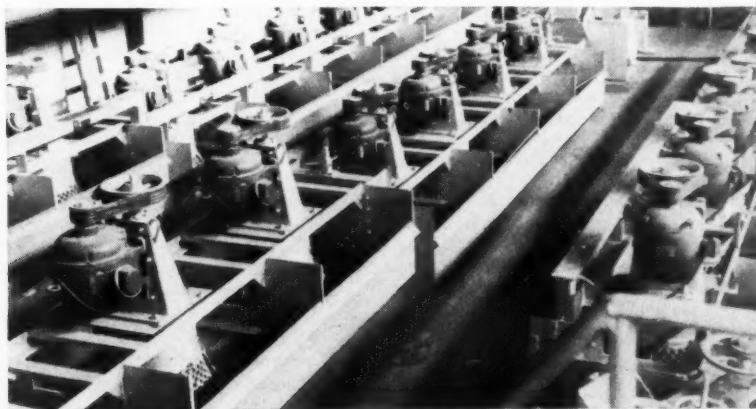
(2) For each STU of WO₃ a deduction of twenty-five cents will be made for each of the following increments in excess of maximum allowances as to each of the following elements:

Percent
0.10 Tin
0.10 Sulphur
0.10 Antimony
1.00 Manganese
0.10 Lead

the wide variety of ore received. The pH in the rougher circuit averages 10.2 to 10.4. Scheelite floats readily with fatty acid collectors and a high percentage of recovery in average ores is possible.

Two main factors that adversely affect recovery in our experience are: (1) overgrinding, and (2) the presence of soluble salts in either the mill water or the ores. The soluble salts are particularly troublesome as they react with oleic acid to form metal oleates, which will result in high tail loss. This condition can be corrected by increasing the amount of soda-ash fed the grinding circuit. One ore required up to 18 lb soda-ash per ton of ore. The classifier overflow is held at 53 percent solids and rougher circuit at 27 percent solids, with the final re-cleaner at 15 percent solids.

As previously stated, scheelite floats readily with fatty acids, but unfortunately so do many of the impurities in the ore. Particularly calcite, apatite, garnet and all the sulphides. To get the highest grade concentrate possible it is necessary to have very close froth control. Froth condition is extremely important and must be worked out in each operation because so many factors affect it. The addition of the modifiers and gangue depressants, i.e. soda ash, quebracho and sodium silicate to the rod mill, which gives us the maximum conditioning time in these reagents appears to be beneficial in making a high grade flotation concentrate. Another factor affecting the concentrate grade is the use of a minimum amount of oleic acid. This is kept to the absolute minimum consistent with good recovery. Too much oleic acid, even minor amounts over that necessary to get recovery, will cause a thick, sticky froth, which will lower the concentrate grade markedly. A "lacy" froth is sought continuously. The optimum recovery is generally achieved when a 30 to 40 percent WO_3 concentrate is made.



A section of the flotation circuit was converted to treat scheelite

	Flotation Concentrate	Final Concentrate
WO_3	35.48 percent	65.67 percent
Phos.	2.19	0.01
S	0.40	0.24
Insol	3.68	7.36

Leaching Procedure at Getchell

Leaching scheelite concentrates with HCl requires close control to prevent scheelite loss. Scheelite is soluble in the acid. The practice at the Getchell as well as some other plants is to use a two-cycle leach. The first leach removes the calcite and the second removes the phosphorus. During the first leach, violent effervescence occurs and the heat of the reaction is sufficient to raise the temperature of the charge considerably. However, in spite of the heat generated, very little scheelite will go into solution due to the presence of the calcium chloride. The same protective action of the calcium chloride seems partially to prevent the phosphorus from dissolving during this leach. It is then necessary to decant the calcium chloride solution and re-leach with fresh acid to remove the phosphorus. This brings the concentrate to a critical point. The protective calcium chloride is not present and high losses of scheelite can occur if the acid strength and contact time are not carefully controlled.

Concentration of HCl used and the time of contact for the second leach necessary to remove the phosphorus and not dissolve scheelite is something that should be worked out in the laboratory before it is attempted in plant practice. Fortunately, where the leaching is done in wooden tanks or in the presence of reducing agents, i.e. carbon, organic matter, etc., dissolved scheelite will reduce rapidly, imparting a tell-tale blue coloring to the solution and so give the operators

a handy indication of scheelite loss.

However, one should not rely entirely on this blue discoloration for scheelite loss. If the leaching is done in the absence of a reducing agent a prohibitive loss can occur undetected, except by assay.

Flotation concentrates are stored in a 44-ft thickener and pumped to the batch acid leaching plant. Two or three tons of concentrates are charged to each of three six by eight-ft wooden agitator tanks. The charge is then settled and decanted. Hydrochloric acid at 20° Baumé is added in agitation until effervescence ceases. The charge is then circulated through an acid-resisting 36-in Fagergren flotation cell and the sulphides and graphite floated from the scheelite until the froth is depleted. Reagents used in this float are frother 77 and quebracho. After the charge is floated, a specific gravity reading is taken and the weight of the charge is calculated. The charge is settled again and all solution decanted. Water is added at the rate of .25 lb H_2O to 1.0 lb concentrate and the charge agitated while 0.5 lb HCl to 1.0 lb concentrate is added. The charge is agitated for ½ hr and then pressed in a 42-in. Shriver washing filter press. The solution is blown from the filter press and the cake is water washed for a half hour. The final concentrate is cleaned from the filter press, dried on electric driers and sacked in 100-lb sacks.

A comparison of the flotation concentrates with the final acid leached concentrate is given above.

The success of leaching flotation concentrates into an acceptable grade depends on, (1) a relatively high grade flotation concentrate that contains a minimum of acid insoluble material, and (2) a closely controlled acid leach and flotation in the acid circuit. This procedure does not remove molybdenum, except that occurring as MoS_2 , but has been successful in enabling us to get a relatively high percent of recovery into a concentrate that meets specifications.

The writer is indebted to the management of the Getchell Mines, Inc., for permission to publish this paper; to Royce A. Hardy, General Superintendent, for his counsel and assistance in its preparation; to Roy Nojima, Chief Assayer, for his technical advice; and to the mill crew for their continuous interest and effort to improve operations.



Simple, easy-to-reach controls are a big contribution to safe operation

MECHANIZATION in the coal mining industry has been very rapid and has increased in tempo in the past few years. New machinery, designed to perform functions formerly done by hand, is continually making its appearance, and we can certainly expect further developments of newer machinery in the next few years. No one manufacturer will be able to furnish all of the units necessary and as a result, it is apparent that most mines will have equipment made by different concerns. Most operating companies attempt to have the same type of loading machines, the same type of cutting machines, etc., and to generally standardize the equipment at any one mine. However, it is not at all uncommon for a company, having say three mines, to use a different type of loading machine at each of the three mines. The same applies to cutting machines, drills, shuttle cars, etc.

The industry has recognized the fact that, if the controls on the more widely used types of machines were uniform, men could learn to operate machines much more quickly, that the usual confusion that arises when a new machine is introduced could be minimized, and that many accidents due to operators making mistakes at the controls can be eliminated.

A study of the controls of loading and cutting machines indicates that at present there is a great deal of uni-

Uniformity of Equipment Controls

Consistency in Location, Direction of Movement and Designation of Mining Equipment Controls Makes Machinery Safer to Operate

formity among the controls as made by the major manufacturing companies. Control Chart "A" shows diagrammatically how the gathering head and rear boom of six different loading machines are controlled. Control Chart "B" shows how the bar and head of two different universal cutting machines are controlled. These charts show the high degree of uniformity in the loading machine controls but indicates the lack of uniformity in the swing controls of the cutting machines.

This report will be confined to recommendations for location, direction of movement, and designation of controls.

Location

- (1) Controls should be located within convenient, comfortable

working reach of the operator and placed so as to cause the least strain upon the operator. Having controls in such a position that operator fatigue is minimized, will contribute greatly to the efficient operation of the machine.

- (2) Controls should be placed so the operator is not exposed to hazards from moving parts of the machine, or exposed to being hurt by the machine itself while operating.
- (3) Where controls are in banks, the various levers should correspond in position generally to the part of the machine they control. For example, the head controls of a loading machine

should be located in the bank toward the head of the machine and the boom controls located at the rear of the bank.

- (4) Controls should be arranged so that the operator can stand or sit in the position which will allow him to focus his attention toward the point requiring maximum attention. For instance, the operator of a cutting machine must direct his attention almost entirely toward the face during cutting or shearing, while the operator of a loading machine must divide his attention between the head and the rear boom while loading.
- (5) Start and stop controls should be located within reach of the operator's normal position while operating.
- (6) Any Emergency Stop or Safety Switches should be located in a position that can be easily and quickly reached from the helpers normal work position, or from the normal position of others who may work around the machine if no helper is cus-

DIRECTION OF MOVEMENT CUTTING MACHINE CONTROLS

Control Chart B

Machine	Cutter Bar		Head		
	Raise	Swing	Raise	Swing	Turn Over
A					
B					

Horizontal lever

Slide lever

U = Up
D = Down
To = Toward operator
Aw = Away from operator

Control Chart B—Direction of cutting machine control movements

tomary. These switches should be of a design that will permit

them to actuate by being struck by a very light blow. A thrown glove should actuate the switch if the setting is proper.

DIRECTION OF MOVEMENT LOADING MACHINE CONTROLS

Control Chart A

Machine	Gathering Head		Rear Boom	
	Raise	Swing	Raise	Swing
Track Mounted Type A				
Track Mounted Type B				
Crawler Mounted Type C		—		
Crawler Mounted Type D		—		
Rubber Tired Type E				
Crawler Mounted Type F				

Vertical lever moved at 90° to long axis of the machine

Vertical lever moved parallel to long axis of the machine

Horizontal lever

U = Up
D = Down
To = Toward operator
Aw = Away from operator

Control Chart A—Direction of various loading machine control movements

Direction of Control Movement

Controls can be of several types; levers, buttons, dials, etc., but the most common is the lever. Whatever device is used, this report recommends that the various manufacturers adopt a uniform policy as to the direction the control be moved to make any part of the machine perform any desired function. A study of present equipment controls indicates that in a large part some standardization has already been adopted as shown in Charts "A" and "B." The following suggestions are made to conform with what the subcommittee has found to be most prevalent in present controls.

- (a) Vertical motions, such as raising or lowering booms or heads.
 - (1) Vertical lever—pull to raise, push to lower.
 - (2) Horizontal lever—lift to raise, push down to lower.
 - (3) Slide lever—pull to raise, push to lower.
- (b) Swing motions, such as swinging heads or booms.
 - (1) Vertical lever—push to swing away from operator and pull to swing toward operator.
 - (2) Horizontal lever—push down to swing away from operator and pull to swing toward operator.
 - (3) Slide lever—push to swing away from operator and pull to swing toward operator.

(c) Turn over motions—cutting machines.

(1) Vertical lever—push to roll away from operator and pull to roll toward operator.

(2) Horizontal lever—push down to roll away from operator and pull up to roll toward operator.

(3) Slide lever—push to roll away from operator and pull to roll toward operator.

(d) Trimming controls.

Wherever possible the most acceptable tram control seems to be a vertical lever that is moved forward to tram ahead

in confined underground working because of mistakes made in steering. This is particularly true of machinery that steers with the rear wheels or that has four-wheel steering.

This committee strongly recommends that all machinery be made to turn in the direction that the steering device turns regardless of the direction the machine is traveling.

Fig. 1 illustrates how the four-wheel-steer shuttle car works and shows how easily an operator could make a mistake when traveling away from the face. This committee feels that fatal and serious accidents have

(b) Recognizing the fact that in operating mining machinery underground the operator is often required to devote 100 percent of his attention to the roof or ribs and that many times, while working in heavily timbered areas, the operator must carefully watch the boom or head of the machine, the recommendation that control handles be made recognizable by feel as well as by sight, is made. For this reason it is suggested that the following be adopted as standard:

(1) Vertical Motion Handles—have a cube knob.

(2) Swing Motion Handles—have a ball knob.

(3) Tram or Steer Handles—have a disc knob.

Inasmuch as the design status of most continuous mining machines is still in a state of flux no direct reference to controls of these machines will be made in this report. However, it is herewith urged that the various principles as discussed above be applied, where possible, to continuous mining machine controls.

The above report is submitted, not with the idea of effecting changes in existing control systems, but rather to present a partial picture of one need of the industry and to present only a few suggestions that may prove beneficial in improving machine efficiency and operating safety.

The Committee on Mechanical Loading will be glad to receive comments on this report and is prepared to make such amendments and alterations as may appear desirable from time to time.

Subcommittee on Uniformity of Equipment Controls

F. R. ZACHAR, *Chairman*.

RICHARD TODHUNTER

HERMAN GOODHART

RICHARD MURPHY

A. E. SHANNON

KENNETH GAINES

ROLFE ARENTZEN

FIG. 1 - FOUR WHEEL STEER SHUTTLE CAR STEERING ARRANGEMENT

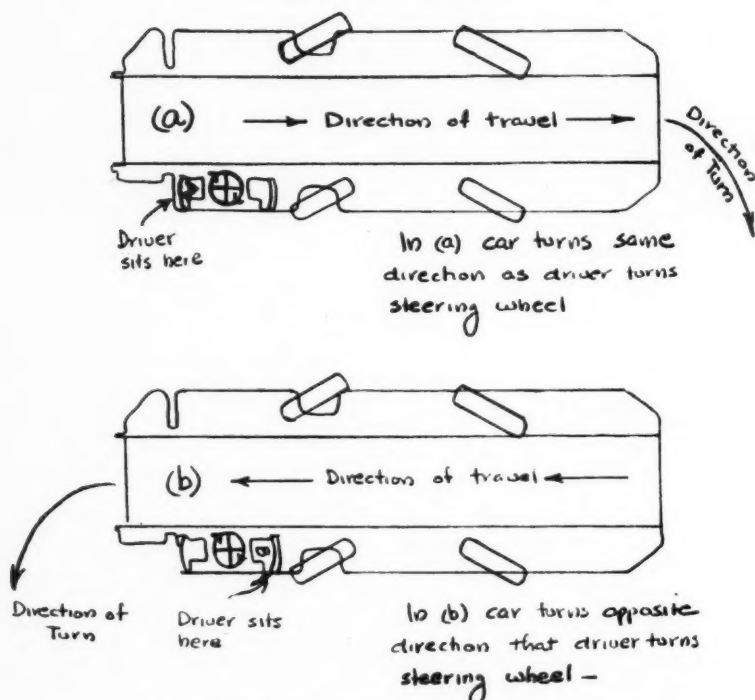


Fig. 1—Steering arrangement of four-wheel steer shuttle car

and moved toward the rear of the machine to back up. If not possible to install this type of control then the following could apply.

(1) Vertical lever—push to tram forward and pull to back up.

(2) Horizontal lever—push down to tram forward and raise to back up.

(3) Slide lever—push to tram ahead and pull to back up.

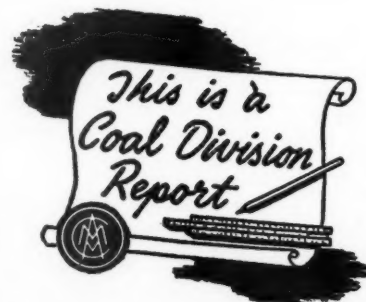
(e) Steering controls.

Many accidents have occurred

been caused by this feature alone and urges that operators and manufacturers give this matter their careful study to see if a correction is practicable.

Designation of Controls

(a) It is herewith recommended that all controls on machinery be marked with a suitable name plate giving the function of the control and being marked with arrows to indicate in which direction the control handles operate.





Coal Convention and Exposition

Cleveland, Ohio—May 11-14

WHEN May 11 rolls around, thousands of mining men from every part of the United States and many foreign countries will be in Cleveland. The reason for this gathering will be the 1953 Coal Convention and Exposition of the American Mining Congress in Cleveland's City Auditorium May 11-14. The Exposition will include everything relating to the mining and preparation of coal. More exhibits than ever before will show machines and equipment for deep and strip mining as well as for preparation plants, shops and power systems.

Keyed to the problems of obtaining maximum output from men and machines, the Convention will point the way to safer mining, more efficient operation and preparation of a higher quality product. Coal's pre-eminent place in our economy was fully recognized when topics were selected for presentation at the meeting. Roof support; latest developments in mechanical mining under various conditions; safety, ventilation and dust control; trends in strip mining; haulage, maintenance and power; management, costs and personnel relations; latest coal preparation tools and methods; as well as up to the minute developments in continuous mining will all be treated as shown in the detailed outline of the program presented here.

All mining men and exhibiting manufacturers will be given an opportunity, well before meeting time, to send in lists of the representatives whom they expect to send. Most mining companies take this occasion to educate, not only management, but also their operating and maintenance personnel in what is new in processes and equipment by sending just as many key men as possible to Cleveland for the Coal Show. Advance registration cards will go to all those whose names are submitted.

With a capacity crowd expected at the 1953 show, accommodations will be handled through the Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13. Requests for reservations should be sent in promptly.

Outline of Convention Sessions

MONDAY, MAY 11

Morning Session—Roof Support— Pillar Extraction

Opening of Convention
Roof Bolting Developments in Several Fields
Pillar Extraction—Light and Heavy Cover

Afternoon—Open—No Sessions

TUESDAY, MAY 12

Morning Session—Conventional Mechanical Mining

Mechanical Mining in Thick and Thin Seams
Mechanical Mining in Pitching Seams
Setting Standards for Face Preparation

Afternoon Session—Strip Mining

Truck Haulage Trends—a symposium by operators and manufacturers
Bucket and Dipper Trends—a symposium by operators and manufacturers

Morning Session—Safety

Seam Degasification by Advance Drilling
Coal Dust Control—sources and prevention
Coal Mine Bumps—causes and prevention

WEDNESDAY, MAY 13

Morning Session—Haulage—Maintenance—Power

High Capacity Track Haulage—construction, equipment and operation
A Complete Belt Mine—installation, maintenance and operation
Reverse Polarity for Mine Circuits

Morning Session—Management— Costs—Personnel

Central vs. Independent Management
Organized Cost Control
Management—human relations in supervision
Effective Speaking to Promote Safety

Afternoon Session—Strip Mining

Highwall Drilling—a Symposium Covering Horizontal and Vertical Drilling

THURSDAY, MAY 14

Morning Session—Coal Preparation

Operating Factors Underground that Affect Coal Cleaning Performances
Fine Coal Cleaning in Anthracite and Bituminous Plants
Heavy Media by a New Type Vessel

Morning Session—Continuous Mining

A Review and Forecast of Continuous Mining
Auger Mining with Remote and Conventional Control
Continuous Transportation from Face

Afternoon—Open—No Sessions

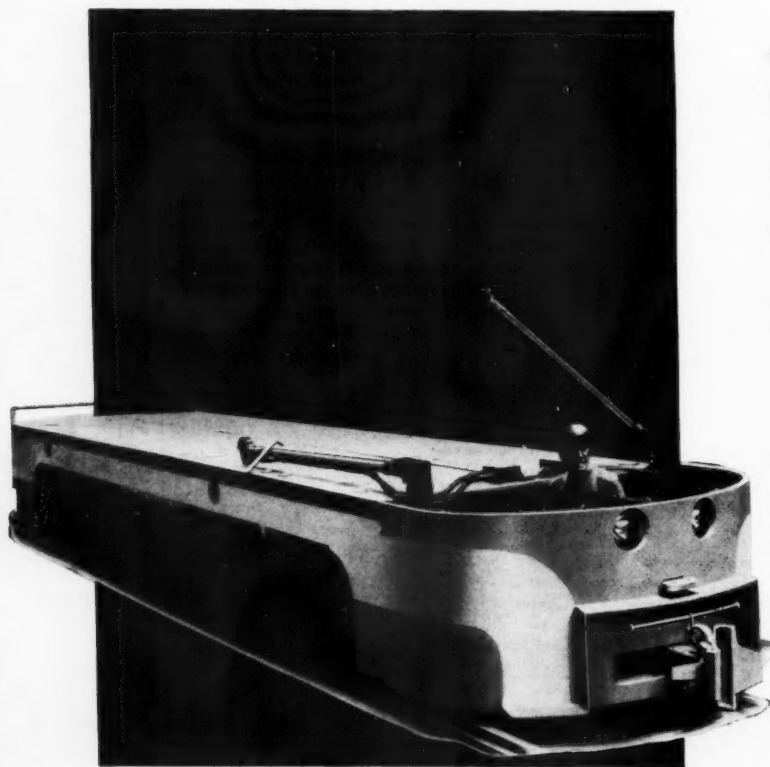


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Dragline mines matrix, dumps it into sump where monitors wash it to pump suction

Hydraulic Transportation Of Solids

Moving Large Quantities of Solids Through Pipelines
is Routine in Florida Phosphate Fields

THE Florida land pebble phosphate field, one of the largest reserves of high grade phosphate known anywhere in the world, covers some 2000 square miles of Polk and eastern Hillsborough Counties in central Florida. During the past seventy years since the discovery of phosphate rock in Florida, an industry has developed which now produces over 8,000,000 tons of saleable phosphate pebble and concentrates annually, which is three-fourths of the United States' production and one-third of the world output.

These phosphates date back at least 15,000,000 years. During the Miocene age much of Florida, as we know it today, was below sea level. The warm, shallow, tropical seas covering Florida abounded in many forms of marine life. Remains of this life and calcium carbonate precipitating out of sea water over many thousands of years formed the Hawthorne phosphatic limestone, which covers much of Florida, parts of Georgia, Alabama, and South Carolina.

By I. S. TILLOTSON
Mining Superintendent
International Minerals & Chemical Corp.

With the subsequent lowering of sea level, the Hawthorne formation was exposed to atmospheric weathering and erosion during the late Miocene and early Pliocene periods. Much of the relatively soluble limestone was removed in solution leaving the less soluble calcium phosphate and silica behind. The Pliocene seas again covered the land, reworking and concentrating the residual phosphate. They then receded and further weathering and erosion took place. Later, just before the last Glacial Age, the sea inundated the land once more and deposited the 10 to 70 ft of fine Pleistocene sand. This constitutes the overburden which covers the phosphate beds. As the seas receded, the present peninsula of Florida was formed.

Phosphate ore, or matrix as it is

termed locally, occurs above the Hawthorne limestone, as a fairly flat bed 10 to 30 ft thick. However, both thickness and phosphatic content of the matrix varies considerably from one location to another sometimes within a distance of only a few hundred feet. This makes extensive core drilling necessary before an area can be mined.

Florida phosphate matrix is essentially an unconsolidated physical mixture of clay, minus one mm silica sand, and phosphate ranging downward in size from an occasional lump 6 in. or more in diameter to particles which will pass a 400 mesh sieve. Generally speaking, there are two types of matrix.

The first is the pebble type in which the bulk of the phosphate occurs in the size range minus one in. plus 16 mesh.

The other is the concentrate type. Most of the phosphate in this size range is minus 16 plus 150 mesh.

A typical pebble type matrix from the Achan mine of International Minerals and Chemical Corp. located

near Mulberry, Fla., shows 35 percent plus 16 mesh, 41.8 percent minus 16 plus 150 mesh, and 22.8 percent minus 150 mesh.

Usually the pebble type matrix will yield a lower grade product than the concentrate type, but due to the ease with which the pebble is removed, simply by washing and screening, a large tonnage of this type is mined in Florida. However, because of the higher grade product from the mining and processing of the second type, the bulk of Florida production, since the advent of flotation in 1928, comes from this material. A typical example of this latter is a sample from the Noralyn mine of International, located south of Bartow, Fla. This sample screened 1.5 percent plus 16 mesh, 73.1 percent minus 16 plus 150 mesh, and 25.4 percent minus 150 mesh.

There are types of matrix encountered in the Florida phosphate field other than those described above. This paper will discuss only the types encountered by International. The procedures for pumping and hydraulic transportation follow generally the lines here described.

For the purpose of simplification, the matrix containing 35.4 percent plus 16 mesh will be called "Achan" matrix; the type containing 1.5 percent plus 16 mesh will be referred to as "Noralyn-Peace Valley."

Mine with Draglines

Mining of Florida phosphates begins with a dragline which does two things: it strips the overburden and casts it into a mined-out pit along side of its current cut; digs the ore, or matrix, and dumps it into a well along side of the cut where it is picked up by a pump and moved to the processing plant.

The well is a hole in the ground, roughly semi-circular in plan, with a

radius about 75 ft. The side of the well next to the dragline is relatively shallow, deepening to about 6 ft on the opposite side. This depth of well is to accommodate the suction of a pump. The dragline stacks the matrix in this well. Hydraulic monitors then sluice it to the suction of the pump.

Hydraulic water for the mining operation is furnished by a centrifugal pump. The water from this pump serves two purposes. It sluices matrix to the pump suction and helps to form the pulp for the transportation of the matrix from the pit through a pipeline to the processing plant.

The head on this centrifugal clear water pump varies with the type of matrix being mined. The Achan, or pebble type matrix requires high pressure at the gun tips in order to break up the stiff clays. The pump at Achan mine has a rating of 4000 gpm against a 477-ft head. For mining the Noralyn-Peace Valley type of matrix where the stiff clays are not present the same type of pump delivers 6000 gpm against 250-ft head. At the sump or well three hydraulic monitors are set up. Two are in operation all the time; the third may be called in for additional help when needed. The tip pressure on the Achan type of matrix is about 110 psi. On the Noralyn-Peace Valley matrix where there is no stiff clay the tip pressure is about 80 psi.

Personnel at the mine consists of the following classifications:

A Mine Leaderman, in charge of all pumps; the clear water pump operator; a suction tender who raises and lowers the suction and may speed up or slow down the pit pump; two monitor operators, or "Gunners" as they are known in this field. There may be one or more lift, or booster pump operators, depending on the distance pumped.

Ratio of total solids to water in the

mixture is the prime factor that must be considered in the practical application of hydraulic transportation of solids.

This ratio determines the specific gravity of the mixture, which enters directly into any calculations involving power requirements. In practice the ratio of solids to water is expressed as percent solids by weight.

It should be remembered that the weight of the solids must be taken on a bone dry basis. Usually in making calculations, the amount of moisture contained in the as-mined matrix is calculated and this value of water is deducted in order to arrive at the weight of dry matrix.

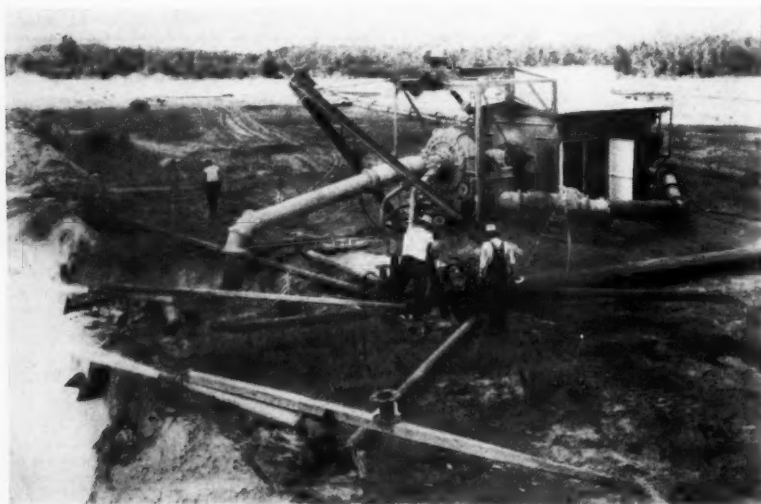
Viscosity and Pumpability

The specific gravity of the mixture is very easily calculated by dividing the weight of a unit volume of pulp by the weight of the same volume of water. The viscosity of the pulp is an important factor in determining the "pumpability" of phosphate pulp. Viscosity is affected by the slime content and it has been found that as the slime content increases the "pumpability" is improved. There has been little, if any, research work done on viscosity and while it is an important factor in pumping, there is no way known to determine with any precision the effect of viscosity on "pumpability."

In order for flow to take place in the pipeline, it is necessary that potential energy be imparted to the pulp and this is accomplished by the centrifugal pump.

The unit of this potential energy is commonly termed "head," expressed in foot-pounds per pound of pulp.

This term is easily understood when only water is involved and the specific gravity of the liquid is unity. With the addition of solids and the accompanying increase in specific gravity the quantity becomes a little more involved. Consideration must then be given the amount of head that can be produced by the pumping unit, and the total head imposed by the pipeline including friction losses, entrance losses at the suction, elevation and all other incidental losses. In practice, it has been found that the use of friction tables for water, sufficiently approximate the values for phosphate pulp. This is particularly true for the matrix handled at the mines of the International Minerals & Chemical Corp. at Noralyn and Peace Valley. It is necessary to increase these values slightly for matrices containing large quantities of plus 14 mesh pebble, such as encountered at International Minerals' Achan Mine. Of course, friction increases with velocity and velocity must be maintained in the pipeline above a critical value to prevent clogging of this line due to settling. This friction loss plays the major part in making up the im-



Car houses pumps for hydraulic water and suction



Pulp consistency is controlled by raising or lowering suction by means of "A" frame

posed head and, consequently, has the greatest bearing on the distance a pumping unit will deliver the pulp. At Noralyn and Peace Valley pulp has been handled successfully through approximately 8000 ft of 16-in. pipeline with one pumping unit. The heads involved approximate 200 ft (pulp head) or 100 psi. At Achan mine it is not possible to produce heads of this magnitude due to the effect of the matrix on the ability of the pump to produce head.

Use Higher Speed at Achan

Since the matrix at Achan contains much more plus 14 fraction pebble, than at Noralyn or Peace Valley, it is necessary to use higher velocities to prevent pipes from clogging. But higher velocities tend to produce turbulence. This, in conjunction with the loss in head produced at the pump by the plus 14 fraction and an accompanying substantial loss in pump efficiency due to the large particles, means more horsepower is required to effect a practical set up. Only 2500 to 3000 ft of line can be handled by one pumping unit, as against 5000 ft on the Noralyn-Peace Valley matrix. This, of course, means greater cost per ton of matrix pumped.

Special Equipment Needed

A mixture of matrix and water must be obtained in a sump or well in which the pump suction line is installed. This pump suction line is suspended in the well by a cable from a hoist mounted on an "A" or boom on the pump car. This makes possible the raising or lowering of the pump suction line in the well and helps control the density of pulp being pumped. Although most solids handling pumps are designed to produce high suction heads, atmospheric pressure limits the amount of suction available to obtain

flow from the well through the pump suction line and into the pump impeller. This simply means that every effort must be made to conserve this suction head. Velocities in the pump suction line need not be as great as those in the discharge line to prevent clogging. This is probably due to the fact that the pump suction line is very short and a substantial portion of the line is vertical. In actual practice the suction head at Noralyn and Peace Valley will range between 12 and 15 ft (pulp head). The pump will perform satisfactorily at heads as great as 20 ft which means a substantial reserve is available to take care of peaks. Of course, in the pump suction line there are friction losses and also six or seven ft of static head, however, a large portion of head is used to overcome entrance losses.

The solids handling pump now in use at Noralyn and Peace Valley

mines is the result of many years of experience and the integration of developments by both the pump manufacturer and International.

Experiments were conducted some years ago at Noralyn mine to determine the best operating speed for these units. It was found that when the speed of the pump exceeded 500 rpm, considerable unbalance existed and the pump became noisy and less efficient. It was also found, by experiment, in field and laboratory, that the shape of the impeller vanes, the suction nozzle and shell substantially affected both the hydraulic performance of the unit as well as the ability of the parts to withstand wear. No criteria were available for the design of the pumps. Solids in suspension do not follow hydraulic theories closely and unconventional methods must be applied in both the design and application of engineering.

Pump Design Rugged

The solids handling pump is quite simple in construction, the major parts being the pump shell or volute, the impeller, the suction side face-plate and the hub side face-plate along with the necessary shaft and bearing assembly. Of course, a stuffing box and gland must be provided. It has been found that the shell should be of thick sections and the material should be as abrasive resistant as possible without being fragile when subjected to water hammer or shock due to the impact of large solids expelled from the impeller. The impeller must be capable of passing large solids and at the same time produce high heads with good efficiencies when handling high solids concentrations. The suction side face-plate is constructed of a steel casting with a wear resistant liner and a separate suction nozzle to facilitate manufacture, and for lowest replacement cost.



Hydraulic monitors with tip pressures of from 80 to 100 psi slulce matrix

The hub side face-plate is constructed in much the same manner as the suction side face-plate. However, the steel casting is provided with an opening for the installation of a split stuffing box for easy removal and servicing. The shaft is forged nickel steel with a large upset shoulder to maintain impeller alignment. The portion that extends through the stuffing box is protected by a large, heavy shaft sleeve which is easily removed when the impeller is taken off the shaft. Substantial radial and axial thrust are created by the action of this type pump. It is impractical to balance these thrusts by holes in the back shroud of the impeller or the application of hydraulic balancing on the suction shroud; therefore, bearings of sufficient size, with ample safety margin to take care of the severest service conditions, are used. The thrust bearing consists of a steep angle SKF unit relieved so that radial loads are not applied. In the same housing a large spherical roller bearing is used to carry the radial loading at this point. These bearings are both of the spherical roller design and are spaced in such a manner that their center of rotation axially is at a common point, consequently, they maintain their self-aligning feature. The radial bearing is a conventional pillow block, properly secured on the bearing pedestal and is sufficiently heavy to effectively carry radial loading imposed by the weight of the shaft and impeller as well as radial thrust developed in the pump shell.

Considering the high heads under which these pumps operate, and the abrasiveness of the material handled, parts last very well. Experience at Peace Valley mine on the 16 by 52-in. pump is as follows:

Part	Life in cu. yd.
Impeller	1,000,000
Shell	3,000,000
Back Head Liner	1,650,000
Suction Head	900,000
Shaft & Bearing Assembly	7,000,000

Insufficient information is available for the comparison of the high alloy white cast irons, against abrasive resistant cast iron, but parts generally last several times as long when made of abrasive resistant metals. This is economical. Abrasive resistant metals sell for twice as much as the abrasive resistant cast iron, so anything over twice the life is a direct saving.

Pumps are installed in a skid car along with a 600 hp, 514 rpm synchronous speed, slip ring motor direct-connected to the pump. To meet speed requirements under various conditions, a speed variation of 40 percent is obtained by means of conventional secondary grid resistors. The car is heavily constructed and is floored with

two-in. boards to accommodate the pump and motor base. The wooden floor is designed to absorb vibration from the pump and motor units and also for the comfort of operating personnel. Electric power at 4160 v is fed to the car by rubber covered cables, laid on the ground surface and connected to the car by suitable plugs. This feature greatly facilitates moving the car as the mining operations progress. Transformers for supplying 220 v for operation of the electric winch and 110 v for lighting are mounted on the rear of a car. The entire unit is a self-contained and a minimum amount of time is required for relocation and getting into operation.

It is quite important that sufficient high pressure water be available at the pump for purging the stuffing box. The 16 by 52-in. pump requires 100 to 150 rpm at 10 to 15 psi above the discharge pressure at the pump. The assurance of a sufficient supply of water for this purging increases the life of packing and shaft sleeves and generally improves the entire pumping operation.

Pipeline Design

Next step along the way toward the washing plant is the pipeline, which on the Noralyn-Peace Valley matrix is a 16-in. I.D. spiral weld abrasive resistant pipe and at Achan is a 14-in. I.D. spiral weld abrasive resistant pipe. The diameter of the pipe is controlled by the critical velocity and the volume of the pulp being transported. At Noralyn and Peace Valley mines, it is generally possible to pump long distances with one unit at a velocity of approximately 11 to 13 fps when handling quantities of pulp at 6000 to 8000 gpm. Spacing of lift pumps is such that a small positive head is maintained on the suction side of the lift pump in order to avoid possible high suction heads and vacuum in the line. Also, the lift pump is usually located where the operators can tend to some other duties, such as the operation of the clear water pumps.

The pit pump is primed by injectors installed adjacent to the suction nozzle of the pump and actuated by the water used for the hydraulic monitors. This is a very satisfactory method of priming. It eliminates the need for foot valves or any type of valve that might be required in the suction line.

Pumping equipment at Achan is smaller and less elaborate than that employed at Noralyn and Peace Valley mines. The 39½ by 14-in. pump at the pit is equipped with a 500 hp, 600 rpm motor and is built of abrasive resistant cast iron. The suction side and hub side face plates are solid construction and do not employ liners. The booster pumps are still smaller, 39½ by 12 in., and are of a much

older design than the one used at the pit. However, the quantities handled at Achan do not approach those handled at Noralyn and Peace Valley so smaller equipment is entirely in order. Pipeline velocities at Achan will run from 13 to 15 fps and as previously discussed, due to the nature of the matrix necessitating these higher velocities, power requirements are heavy.

Pumps used at Achan cost from \$4000 to \$6000 depending on appurtenances and specifications, and the type used at Noralyn and Peace Valley will range from \$12,000 to \$14,000 depending on specifications, etc.

On an average at Noralyn mine it requires about 0.480 kwh per cu yd-mile of matrix pumped. At Achan mine it requires 1.860 kwh per cu yd-mile. This is due to the higher velocity required by the different type of matrix at Achan.

Pumping, on hydraulic transportation of matrix at Peace Valley mine for July, 1952, averaged 564 cu yd per hr with pulp containing 35.3 percent solids and a specific gravity of 1.282. This quantity was pumped an average distance of 6182 ft with one 16 by 52-in. pump. At the Noralyn mine in June, 1952, an average of 846 cu yd per hr of 43.56 percent pulp at specific gravity of 1.30, was pumped. Average pumping distance for the month was 11,605 ft. At Achan in June, 1952, the average was 300 cu yd per hr at 21.99 percent solids and a specific gravity of 1.16. The average distance was 4950 ft. There are certain economic reasons why the average hourly pumping at Achan is low; however, due to the difficulty in pumping and transporting it is almost certain that 500 cu yd per hr is the upper limit for this type of matrix.





Belt conveyors are replacing other methods of lowering coal and ore

Drives For Descending Belt Conveyors

Low Maintenance, Minimum Degradation, Maximum Power Regeneration Advantages of Lowering Coal or Ore on Belts

By R. U. JACKSON

Manager, Mine Conveyor Sales and Development
Robins Conveyors Division
Hewitt-Robins Incorporated

DESCENDING belt conveyors are rapidly becoming the accepted medium for conveying bulk materials such as ores, stone, coal, etc., from high level mining areas to lower level preparation plants for rail and water transportation to market.

One of the methods being replaced by belt conveyors is the system of long, steep chutes equipped with offset ore or coal pockets spaced at intervals to retard the speed of the material. These were usually placed on steep grades, causing excessive degradation and high maintenance.

Another system that is now being replaced is made up of long, steep, circular steel tubes, of three to six-ft diameters, which required close supervision to obtain even a semblance of

efficient operation. For satisfactory operation, it was necessary to keep the tube full of material and to withdraw from the bottom at the same rate as the feed at the top. Here again, the high percentage of degradation, high maintenance, and the hazard of freezing in cold weather were serious disadvantages.

Two other systems paralleled each other: The descending scraper conveyor, and the rope and button conveyor. Both systems were based on steel flights riding the bottom of a carrying trough—the scraper using chains and flights, while the other used a steel cable with buttons attached at spaced intervals. With both systems, great degradation, high maintenance costs and an unknown factor

in frictional resistance of the material in contact with the trough was present. This last factor changed constantly with the change in moisture content of the material. It also changed with every different coal seam. To design this type of conveyor properly, it was necessary to alter the friction factor to suit each material handled. As a result, many units were installed with power units either too large or too small.

Another system was the inclined plane, using either cars or skip buckets. Here there is degradation during both the loading and unloading of the skip. The system also has the disadvantages of intermittent transportation and requires balancing bins at both the discharge and feed ends.

With the descending belt conveyor, there are the advantages of continuous transportation, uniform discharge and a system that can be under observation at all times during operation. The material load rides stationary on the moving belt with minimum degradation. The elements of the conveyor equipment, such as the weight of belt, weight of moving parts and the frictional resistance of the idler bearings are known factors.

The following examples are cited to show a few descending belt conveyor drive arrangements with their respective conveyor outlines. Data pertaining to conveyor length, descent, mate-

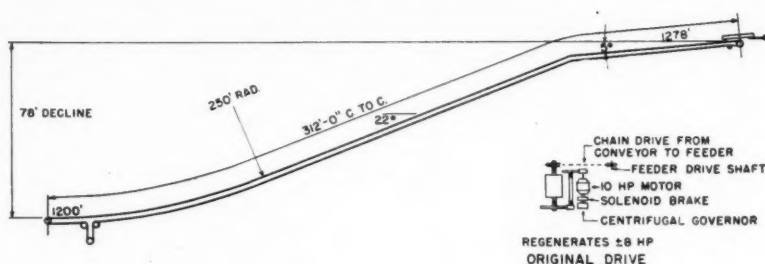
rial handled, capacity, and power are given to show the requirements of each unit. Design formulas, stress analysis, etc., are not treated, however, no conveyor discussion could be concluded without calling attention to certain features of design and equipment that are now considered necessary or advisable for good operation.

Drive at Lower End

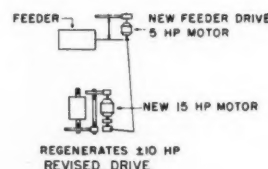
The first example is a 36-in. belt conveyor which was installed in Pennsylvania in 1925 and was one of the first descending belts of that length. It is on 710-ft centers, descends 112 ft, handles 100 tph of ROM coal at a belt speed of 110 fpm. It is equipped with plain bearing idlers and powered by a 10-hp motor. This conveyor was supported on wood frames and mounted on mud sills, thus giving a variable belt line of 6 to 12° as it followed the ground contour. The conveyor was designed using standard idler friction factors of that date. Only minus-0.88 hp was required when fully loaded on the slope section. Because of this low negative power requirement, the drive was located at the discharge end for convenience in interlocking with tippie equipment. It soon became evident that a solenoid brake on the tail shaft was needed to provide against a long over-travel with power failure, or normal stopping under load. This has been a very successful unit and is still in operation with most of the original equipment.

Redesign System

Example Two, a 30-in. conveyor was installed in West Virginia in 1938. Coal handled was very friable, shot hard with powder, and had so few lumps that no spillage troubles were encountered on the 22° decline. The conveyor is on 312-ft centers, descends 78 ft, handles 200 tph of ROM coal at 250 fpm. Against engineering recommendations, the original drive was installed as shown. The idea being



30" CONVEYOR
SPEED = 250 FPM
CAPACITY = 200 TPH
MATERIAL = 8" ROM COAL
MOTOR = 10 HP
INSTALLED 1938



Original drive was installed against engineer's advice

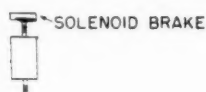
to utilize the power required for the shaking feeder to help brake the conveyor—also, to eliminate the extra motor and drive reduction for the feeder. Originally, the conveyor was powered with a 10-hp motor, had a solenoid brake on the extended motor shaft and a centrifugal governor. When the conveyor belt over-speeded, due to excess load being fed, beyond the ability of the motor to regenerate braking power, the centrifugal governor interlocked with the motor, opened the circuit, and applied the brake.

During trial operations, this severe braking became so frequent that the solenoid brake shoes soon failed and the conveyor finally ran away. In fact, the faster the belt ran, the faster the feeder operated which in turn fed more coal and increased the belt speed, until the bin over the feeder was emptied. The originally recommended drive was then installed. This included a separate feeder drive and motor, increasing the conveyor motor to 15 hp, the same solenoid brake but with the centrifugal governor interlocking the feeder motor only. When

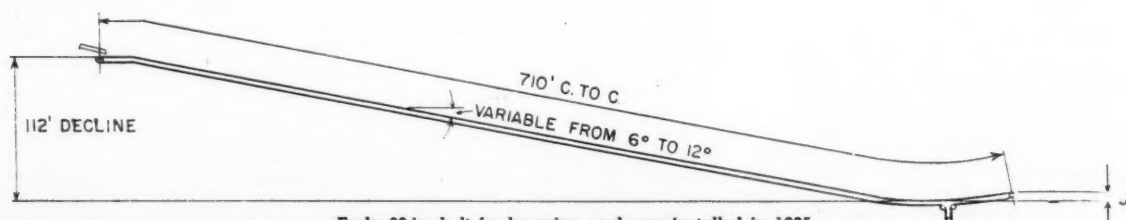
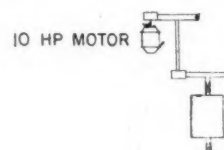
the belt started to overspeed, the centrifugal governor stopped the feeder, but regenerative power was retained for braking at the belt. As soon as part of the load was discharged from the belt, it returned to normal speed and the feeder started operating. The solenoid was only used for power failure or stopping the system.

Used Standard Belt

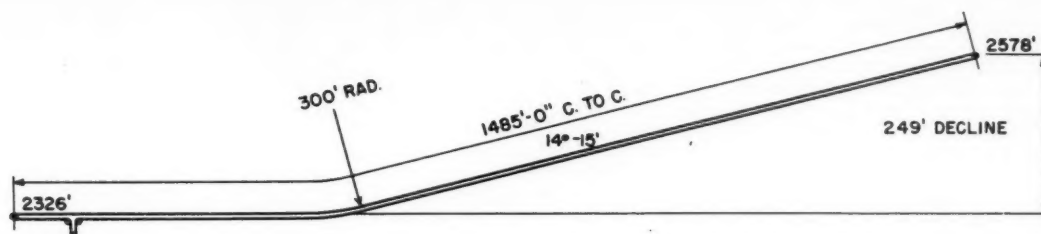
Another example is a 36-in. sloping belt conveyor installed in West Virginia in 1945. This one is on 1485-ft centers, with a drop of 249 ft. The conveyor handles 250 tph of ROM coal with a belt speed of 312 fpm. Estimated regenerative power is 40 hp, and a 50-hp motor was used for regenerative braking. This conveyor was speeded up about 25 percent to maintain a belt tension suitable for use of standard construction belt and at the same time retain good troughing. The drive is from a single pulley, rubber lagged and well snubbed, using a chain reduction and gear reducer, to which the motor is direct



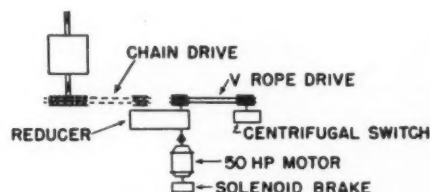
36" CONVEYOR
SPEED = 110 FPM
CAPACITY = 100 TPH
MATERIAL = ROM COAL 18" MAX
ESTIMATED POWER = -0.88 HP TO +7.3 HP
IDLERS ARE 5" Ø PLAIN BRG.
INSTALLED 1925



Early 36-in. belt for lowering coal was installed in 1925



36" CONVEYOR
SPEED = 312 FPM
CAPACITY = 250 TPH
MATERIAL = MAX. SIZE ROM COAL
ESTIMATED POWER = -40
INSTALLED 1945



Thirty-six-in. conveyor was speeded up about 25 percent to permit use of standard belting

connected and equipped with a solenoid brake mounted on the extended motor shaft. The centrifugal switch is V-belt driven from the high speed shaft of the reducer and interlocked with the control of the feeder.

Extra Brakes Installed

Similar to the above installation is a 36-in. conveyor on 848-ft centers, with a 241-ft drop. It handles 350 tph at 300 fpm and is motored by a 75-hp motor for regeneration. In this case an extra precaution was taken by installing two thruster type brakes; one on the extended shaft of the drive pulley, and one on the extended high speed shaft of the reducer.

Handle Heavy Iron Ore

A descending conveyor system was installed for handling iron ore from the mine of Cia Vale Do Rio Doce, Itabira, Brazil. The system is com-

posed of four 36-in. belt conveyors with lengths of 894 ft, 500 ft, 1048 ft, and 784 ft. They handle the iron ore at a rate of 960 long tph, with a belt speed of 360 fpm. The estimated power varies from minus 103 hp to minus 119 hp.

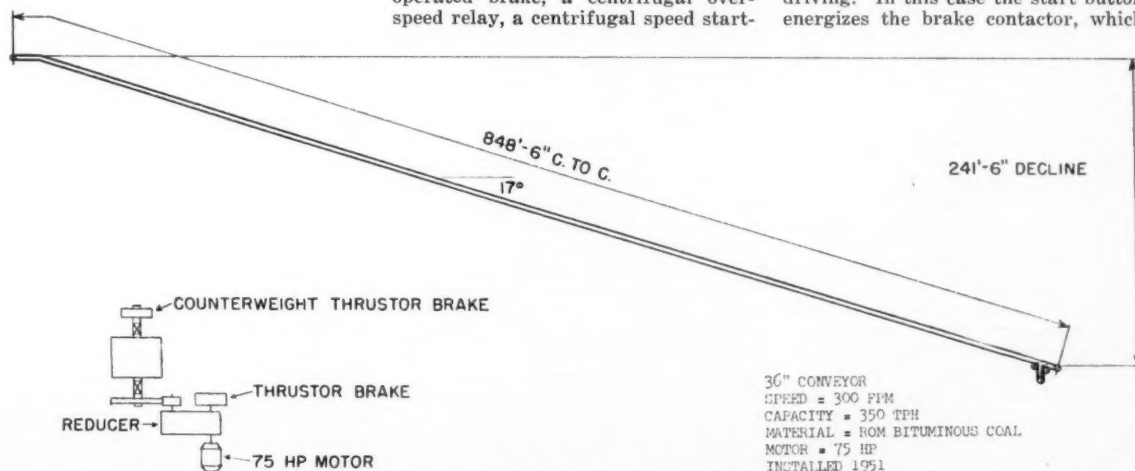
Feed to the conveyor system comes from a special feeder and tunnel conveyor located underneath a surge pile. Because the ore varies in weight between 150 and 200 lb per cu ft, a weighing device is provided on the tunnel conveyor. This weightometer is electrically interlocked with the variable speed drive of the feeder in such a way that when the ore runs light, the feeder is speeded up and when the ore runs heavy, the feeder slows down. By this means, the tonnage to the descending belts is held fairly constant at 960 long tph. The same drive of 125 hp has been provided for all four conveyors. Each motor is equipped with a thruster-operated brake, a centrifugal over-speed relay, a centrifugal speed start-

ing relay, a reduced voltage reactor type automatic magnetic controller and the necessary protective features.

A main control station is located in the screening station which is fed by Conveyor No. 4 of the decline conveyors. This control is a complete floor-mounted metal enclosed operator's cabinet, in which are flush mounted push button stations and red indicating lights for each unit, including the controls for the screening station units, the feeder and tunnel conveyor under the surge pile, as well as the four descending conveyors.

Belt Operation Integrated

After the operator receives his light signal showing the screening station units in operation, he starts Conveyor No. 4 and allows it to come up to full speed, at which time a red light glows on his board. This is his signal for starting No. 3 belt. When No. 3 is carrying no load, power is required for driving. In this case the start button energizes the brake contactor, which



As an extra precaution two thruster type brakes were installed

in turn energizes the thruster motor and releases the thruster-operated brake. Two timing relays are also energized at this time through a brake contactor interlock and they are set for 6 and 12 seconds respectively. After 6 seconds, timing relay No. 1 closes its interlock which is in series with the start contactor which connects the starting reactor in the line and applies reduced voltage to the motor. Timing relay No. 2 has been set for 12 seconds and after that time, it closes its contact and connects the motor to the line. It is not intended, however, that timing relay No. 2 shall come into play under normal operating procedure and its timing, as well

line. Since the motor is up to synchronous speed, the closing of the run contactor will have no effect on the line conditions, so the motor proceeds to regenerate power.

When conveyor No. 3 is running at full speed, its red indicating light glows on the control panel and the operator pushes the start button for No. 2 and the same sequence is followed.

Power Failure Precautions

As a safety precaution against the possibility of a power failure, a second centrifugal speed relay protects the equipment against "run-away."

As a further safety measure, two

emergency stopping. They are not desirable, however, during normal operation and in order to avoid them, the "Multiflex Timer" has been added to the control panel. Through this Timer, the operator may stop the four slope conveyors in sequence with the proper time delay between each conveyor, starting with the tunnel belt on Conveyor No. 1.

This one system of multiple descending conveyors in tandem is described in more detail than the single units because with all multiple units the control problem is more complicated and the hazards of operation more serious.

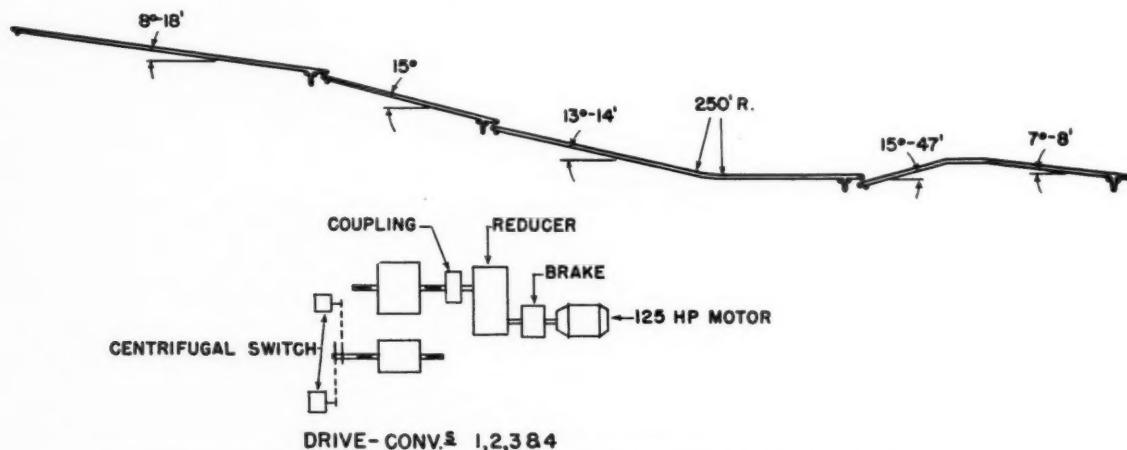
Even though the system of multiple

36" CONVEYOR NO. 1
SPEED = 360 FPM
CAPACITY = 960 TPH
MATERIAL = IRON ORE
894' CTRS - 129' DROP
EST. POWER = 103.5

36" CONVEYOR NO. 2
SPEED = 360 FPM
CAPACITY = 960 TPH
MATERIAL = IRON ORE
500' CTRS - 129' DROP
EST. POWER = 114.5

36" CONVEYOR NO. 3
SPEED = 360 FPM
CAPACITY = 960 TPH
MATERIAL = IRON ORE
1048' CTRS - 142' DROP

36" CONVEYOR NO. 4
SPEED = 360 FPM
CAPACITY = 960 TPH
MATERIAL = IRON ORE
764' CTRS
EST. POWER = 119.0



Four-conveyor system in Brazil lowers 960 long tons per hour of ore which weighs from 150 to 200 lb per cu ft

as the reduced voltage applied by relay No. 1, should be field adjusted so that the centrifugal speed relay will act first. This centrifugal speed relay, which is driven by the drive snub pulley shaft, also has its interlock connected in series with the run contactor on the starter.

When the conveyor has reached rated speed, this interlock closes, energizing the run contactor and connects the motor to the line. This point of transfer will be made so close to synchronous speed that the transfer will be accompanied by a very low transient torque condition and without adding extra stress on the belt.

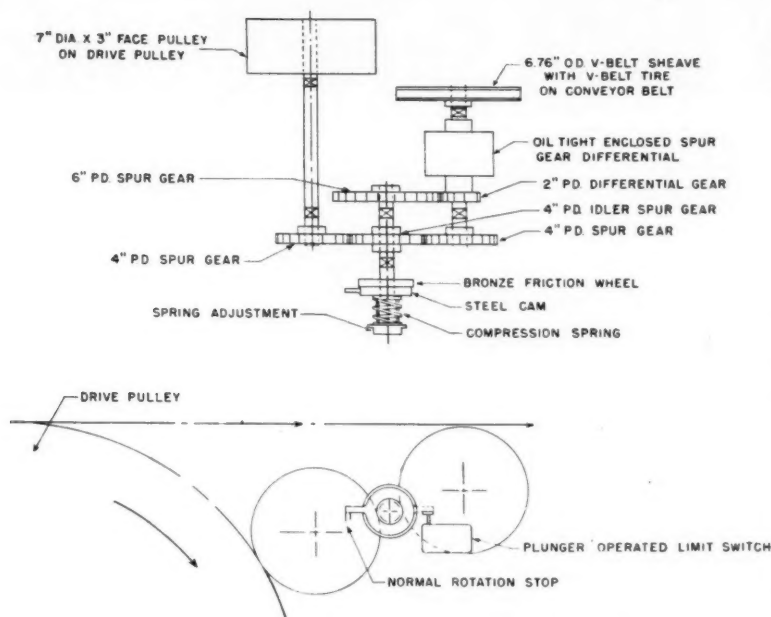
When the conveyors are fully loaded, the start button energizes the brake contactor, thereby releasing the brake. The two timing relays are also energized at this time, but as they are set for 6 and 12 seconds and the fully loaded conveyor will come up to speed in four or five seconds, neither one will act, for the centrifugal speed relay will connect the motor to the

limit switches have been provided on the thruster brake of each slope conveyor to assure the setting of the brake before the motors are actually removed from the line. Since this is a regenerative system, the motor and conveyors would "run-away" if removed from the line and the brake failed to set.

When stopping operations at the end of a day or shift, the operator stops the feeder under the surge pile and clears the system completely before leaving his station. However, contingencies do arise wherein part of the system must be stopped without clearing the belts, which requires stopping under load. Due to the physical characteristics of each individual conveyor, the time interval required to stop each conveyor under load varies. This would cause a pile-up of material in the junction chutes between the conveyors, if they were all stopped simultaneously. These chutes have adequate capacity to take care of these pile-ups and they will occur under

units described is not old and possibly many more systems of similar design will be installed in the near future, the trend today is away from complexity toward simplicity. It is conceivable that a design for decline conveyors will be developed soon, where one unit conveyor will be installed rather than four. Perhaps it will be possible to move greater tonnages further and lower them greater distances without the use of more expensive belting. With one conveyor all complicated interlocking control would be eliminated and more important, degradation at transfer points would be avoided.

Additional controls are advisable for all belt conveyors, including descending units. One such control unit is a differential limit switch, designed to detect slippage between the conveyor belt and the driving pulley. The reasons for using this control are: first, to advise the operator that proper slack-side belt tensioning is not being applied for driving; second, to



Mechanically operated limit switch is an important safety control

eliminate the hazard of a serious fire from heating of the pulley lagging and the belt; third, to prevent belt damage.

Operation of a mechanically operated differential limit switch is described below. Possibly an electrical type can be designed to function with equal accuracy.

During normal operation with virtually no slip between pulley and belt, the V-belt sheave, riding against the belt, rotates at a higher speed than

the roller riding against the drive pulley because it is of smaller diameter. The sheave is mounted on one through shaft of the differential and the roller is geared with a one to one ratio to the other through shaft of the differential. The gear of the differential rotates in the direction of the higher speed through-shaft, from the sheave, at half the difference in speed of the two through-shafts. This rotation is transmitted to a bronze friction wheel which in turn rotates

a steel cam. The cam will rotate to the "normal rotation stop" and will rest there while the friction wheel will continue to rotate.

Mechanical Limit Switch

The diameter of the V-Belt sheave is calculated so that operating with three percent slip between pulley and belt, the speed of the sheave is the same as that of the seven-in. diameter pulley. With any slip beyond three percent, the seven-in. pulley is rotating faster and the differential gear changes direction. This reverses the friction wheel and the cam. The latter then operates the limit switch which opens the circuit. The limit switch is snap action and maintained contact and as the speeds of the pulley and belt reduce and equalize in stopping, and the direction of the differential gear and cam again reverse, the circuit will not close. The limit switch is manually reset and this must be done at the switch. The cause of slippage must be investigated and corrected before operation is resumed.

Limit switches should also be provided to detect side travel of major belt installations, to detect poor belt training and guard against belt damage.

The return belt should be located below the supporting deck and conveyor stringers to permit visual inspection at all times.

The most important suggestion of all is for management to equip maintenance men properly so they can maintain good housekeeping—the one basic factor that will provide efficient conveyor operation.

Diesels Underground

(Continued from page 26)

end drifts furnishes a total of 30,000 to 32,000 cfm of air. The tunnel acts as the mine exhaust and eliminates the contaminated air created by the diesels in the tunnel from being carried into the mine proper.

Frequent tests of the air for carbon monoxide by the company and periodic tests during the past 3½ years by both the State Mines Department and the Insurance Carrier have failed to locate a concentration of carbon monoxide or oxides of nitrogen which even closely approaches the maximum allowable limits of 100 ppm of carbon monoxide and 25 ppm of oxides of nitrogen. Special care and more frequent tests are made in dead-end drifts in which the air is supplemented by booster fans or small blowers on churn drill holes.

The loading and hauling equipment used in the daily operation consists of two ½-yd electric-powered boom shovels, one diesel-powered loader,

one D7 bulldozer and four Koehring Dumpsters. The electric shovels load all the ore except in development drifts or confined areas where the diesel loader is used. The bulldozer piles up the fly dirt, levels off broken ore for the jumbos to operate and maintains roads. Four Dumpsters haul the ore to the mill and a fifth Dumpster stands by as a spare. Seldom are there more than two Dumpsters with engines running in the mine proper at the same time. Various other diesel equipment is used in jumbos and powder loading but the engines only operate a few minutes with long idle intervals. No scrubbers or any other devices to combat the diesel exhaust are used on any of the equipment but great care is taken to keep all the engines in first class condition to avoid unnecessary smoke and foul odors. Each truck is serviced and carefully checked daily at the surface shop. There is no definite time limit as to when an engine needs a general overhaul; however the trucks average one every two years.

The haul from the various mine stopes to the mill averages 1.1 miles

which includes 2700 ft up a 10 percent grade. Each truck averages roughly 16 trips per shift carrying 8.7 dry tons per load.

The total haulage costs per ton mile for the fiscal year ending June 30, 1952, during which 289,829 tons of material was transported are:

	Cents per ton
Labor	0.1153
Diesel fuel	0.0163
*Maintenance and repairs.....	0.0647
Tires	0.0273
Total operating cost of trucks	0.2236
Road maintenance	0.0104
Total haulage cost before truck depreciation.....	0.2340

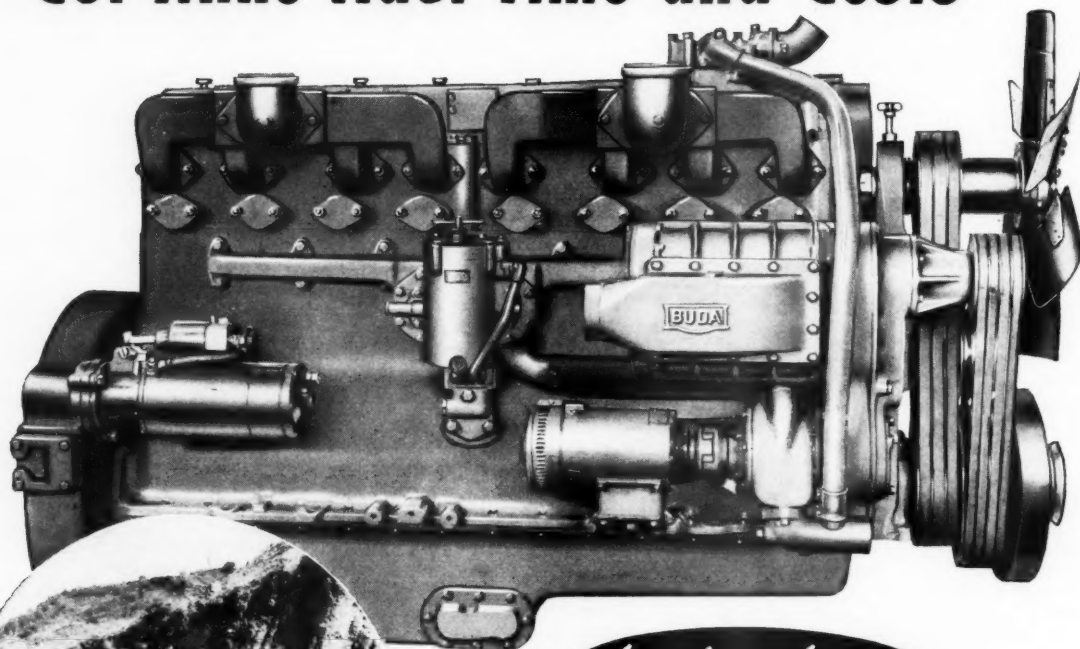
* Includes shop labor chargeable to trucks.

Each truck is set up on a five-year amortization basis which figures out on a tonnage basis as approximately 2.7 cents per ton mile.

In this particular instance, haulage costs cover three phases of the usual mining operation; underground haulage, hoisting and surface haulage.

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Buda 1125 Dyna-Swirl Diesel powers this Model 140 Dart Truck at Bagdad Copper Corp.



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BC-11

Develop New Grease For Walking Cams

By D. R. OBERLINK
Standard Oil Co. (Indiana)

WITH the development of new machinery and bigger equipment, comes the necessity for developing new lubricants capable of handling higher speeds and heavier loads. Oil company lubrication engineers and research personnel, together with experts from the equipment manufacturers are sometimes faced with troublesome lubrication problems. A good example of a problem that had the experts scratching their heads was greasing the giant cams on electric walking draglines used in strip or open-pit mining.

Mammoth machines have been designed and built for the bigger operations. The total weight of these giants reach 1500 tons and buckets with capacities of up to 25 cu yd are used. The principal advantage of the walking dragline is its mobility.

Huge motor-driven cams make the walking motion possible. As the cams rotate, 48-ft shoes are advanced, rest on the ground, and the leading edge of the dragline lifts and the machine skids along the ground. The "step" taken, on a 1300-ton machine, is about seven ft. Walking speed is about one-tenth mph. Lubrication of the giant cams while the machine walked caused trouble.

As larger draglines were designed, lubrication requirements became more critical. Conventional lubricants in

general use on mining equipment would not provide a lubricating film—were squeezed out—under the weight of the dragline on the rolling cam. To withstand these tremendous pressures, attempts were made to "doctor up" existing greases and compounds by adding solid fillers such as graphite, red lead, and inorganic bulk materials. One operator tried throwing pieces of wood crating under the cam in an effort to help the grease support the load. Various types of extreme pressure additives were tried. The rolling cams gave immediate and positive notice when there was insufficient lubrication by emitting crackling and popping noises and clouds of blue smoke. When the lubricant was not able to provide a cushioning lubrication film, cutting and chattering was quite evident.

Engineers Study Problem

The problem was turned over to lubrication engineers who, after considerable study and testing, developed a product that seemed to be effective in this difficult application. It was found that a ductile, asphalt-base product with a high percentage of special additives gave the best results. Heavy asphalt stock was necessary to act as an adhesive, tough film base for the load-carrying additives. The addi-



Bigger draglines introduced special lubrication problems

Operators Corner

tives provided extreme pressure and metal wetting properties. This special grease spread out in front of the rolling cam forming a thin, tough film with a smooth, cushioning effect which prevented metal-to-metal contact.

The newly developed cam lubricant was highly satisfactory until hot weather was encountered. When temperatures in the pit reached and exceeded 100°F the lubricant became soft and ran off. Insufficient lubrication caused the cam to become overheated. In some instances it was necessary to stop the dragline and apply ice packs to cool the hot metal to prevent the lubricant from melting. Further research work and testing was necessary to overcome this hot-weather deficiency and new combinations were developed and tested in the laboratory.

Field Test New Formula

The best means for a true evaluation of new lubricants is actual field testing. Several of the new formulations were tested on draglines moving on a long dead-head walk during hot weather. By observing actual performance, it was found that a lubricant containing an asphalt base of higher melting point did the job. The higher melting point kept the lubricant from excessive softening during the hot weather. The revised formulation thus solved hot weather problems.

A totally different problem gave trouble during winter operation. The product which gave such satisfactory service during the summer months had a tendency to become brittle and would crack and peel off at sub-zero temperatures. Again lubrication engineers and researchers looked for a better product. They developed a modified product using a different asphalt base and added a plasticizer to keep the cam lubricant from hardening. This proved to be a satisfactory winter lubricant. They now had two heavy duty cam lubricants—a high temperature product for use at temperatures above zero and a winter grade for use at sub-zero temperatures.

Since the new cam lubricant is solid in consistency, it is most convenient to apply. Small chunks are gouged or

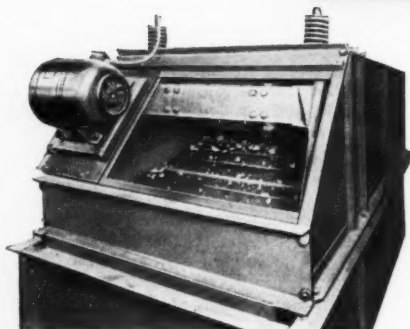
(Continued on page 67)

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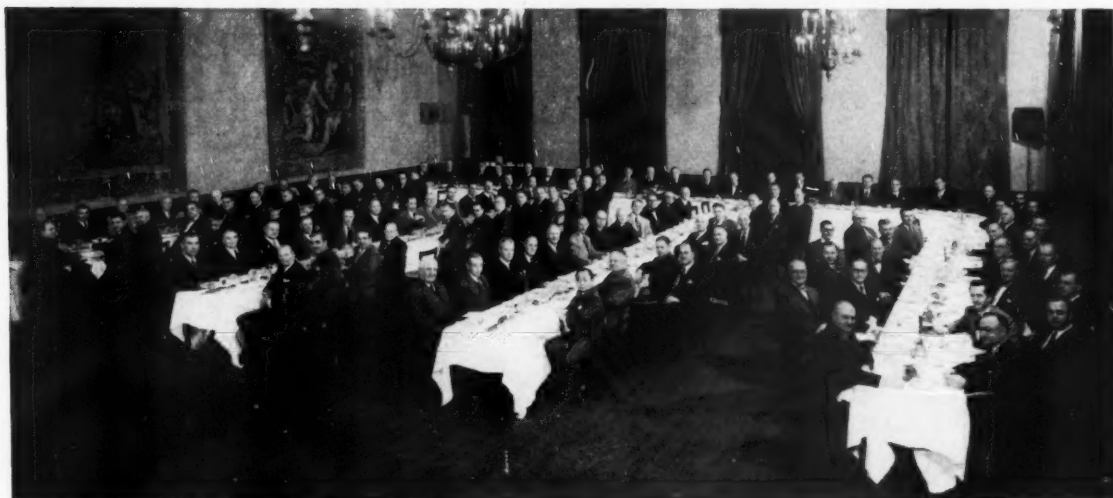
Mine Hoists



"SYMONS"
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Grizzlies and Screens



Diesel Engines



Annual Business Meeting

New York Gathering Brings AMC Members from Every Part of the Nation

ON Tuesday evening December 4 the American Mining Congress convened in New York for its 54th Annual Business Meeting. In spite of bad weather, mining men from all parts of the country gathered for the meeting. The social hour before dinner provided an excellent opportunity to compare notes, renew old friendships and make some new ones.

Following dinner the meeting was called to order by President Howard I. Young.

AMC executive vice-president Julian D. Conover delivered an informal report reviewing the accomplishments of the Mining Congress during the past year and outlined briefly what the country, in general, and the mining industry, in particular, can expect with the change of administration in Washington. In summing up he pointed out that there are tremendous problems ahead and that mining men everywhere should take every opportunity to speak out on national policies with the assurance that their views will receive consideration.

"Many of you," he said, "may be called on to serve the new administration." He hoped those invited would accept, so that our Government may have experienced guidance in shaping sound mineral policies.

Andrew Fletcher, chairman of the Finance Committee, presented his report. The American Mining Congress, he said, is in sound financial position

During the past year, 51 new mining companies were added to the roster, as were eight new members of the Manufacturers Division.

Mr. Young expressed warm appreciation for the fine work and loyal support of the entire industry and called on Henry B. Fernald, chairman of the Tax Committee, for a few words. Mr. Fernald thanked the members for their help during the last two strenuous years and presented a brief outline of the many-sided activities of the Tax Committee. He said that it is difficult to predict, at present, what slant future legislation will take, and called for continued support and co-operation from every branch of the industry.

Ellsworth C. Alvord, counsel to the Tax Committee, spoke on the responsibilities which have come with the change in administration. He pointed out that the new administration will need time to grasp and act upon the many problems with which it is faced. He urged that it be allowed to decide what is best for America because that will be best for all.

Mr. Young then asked J. J. Forbes, director, U. S. Bureau of Mines, and H. M. Bannerman of the U. S. Geological Survey to rise and be recognized, and then requested J. D. Francis to address the meeting. Mr. Francis spoke briefly on the role of the mining industry in the new government, and asked that mining men co-operate with the next administration

to find the best solution for the questions that beset both Government and Business. He called for a "rifle" approach, with unity of action and thinking, rather than the "shotgun" approach when bringing the mining industry's advice to the attention of government.

Speaking as deputy administrator of Defense Materials Procurement Agency, Howard I. Young expressed his satisfaction and thanks for the fine help the industry has rendered toward the solution of the nation's metals problems.

Rolla D. Campbell presented the report of the nominating committee and the following were unanimously elected to serve as directors for a term of three years: R. E. Dwyer, president, Anaconda Copper Mining Co.; V. P. Geffine, vice-president, Cleveland Cliffs Iron Co.; R. K. Gottshall, vice-president, Atlas Powder Co.; L. Russell Kelce, president, Sinclair Coal Co.; D. S. MacBride, president, Hercules Cement Corp.; C. J. Potter, president, Rochester and Pittsburgh Coal Co.; Neil W. Rice, chairman of the board, U. S. Smelting Refining and Mining Co.; Merrill E. Shoup, president, Golden Cycle Corp.; Howard I. Young, president, American Zinc, Lead and Smelting Co.

Following adjournment, the Board of Directors gathered in an adjoining room. At this meeting they elected Howard I. Young president for another term. Worthen Bradley, Andrew Fletcher and William J. Jenkins were elected vice-presidents and Julian D. Conover, executive vice-president and secretary. A substantial part of the Directors' meeting was also devoted to discussion of various industry matters.

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True simplicity of design, with large, strong parts make the Bucyrus-Erie 1 1/2-yd. 38-B an outstanding mining machine . . . both for efficiency and dependability.



Wheels of GOVERNMENT



As Viewed by A. W. DICKINSON of the American Mining Congress

PRECEDING the forthcoming inauguration of President-elect Eisenhower on January 20, the new 83rd Congress convened January 3, and under Republican leadership both Houses are proceeding to organize the regular Committees.

The Senate immediately elected as its Majority Floor Leader Senator Robert A. Taft of Ohio, with Senator Styles Bridges of New Hampshire as President Pro Tempore. Senator Eugene Millikin of Colorado is Chairman of the Republican Conference, which includes all Republican Senators together with House leaders. Senator William F. Knowland of California is Chairman of the Republican Policy Committee, and Senator Leverett Saltonstall of Massachusetts is Assistant Majority Leader.

The Democrats elected Senator Lyndon B. Johnson of Texas as their Minority Floor Leader, with Senator Earle C. Clements of Kentucky the Democratic Whip and Assistant Minority Leader.

On the House side veteran Speaker Joseph W. Martin of Massachusetts moved quite naturally into the Chair vacated by Sam Rayburn of Texas, while Charles A. Halleck of Indiana resumed his 80th Congress post as Majority Leader.

In the administrative end of the new Government organization, three Treasury Department selections are of pointed interest to the mining industry. Designated as Undersecretary of the Treasury is Marion B. Folsom of Rochester, N. Y.; as Assistant Secretary, H. Chapman Rose of Cleveland; and as Special Consultant, W. Randolph Burgess of New York.

Taxation

The House Committee on Ways and Means under Chairman Dan Reed of New York expects to open hearings on a general revision of the revenue laws, perhaps early in April. By that time the trend of the appropriations measures will be established and the revenue receipts as of March 15 will be known. Meanwhile the Joint Committee on Internal Revenue Taxation

under Colin Stam is assembling its recommendations on changes in the law for the use of the Ways and Means Committee.

The National Security Resources Board has called for a reconsideration of the percentage depletion allowances to nonmetallic minerals, and this may receive attention from the Committee.

NSRB Report

On December 10 the National Security Resources Board submitted its comments on the Paley Report, and presented in condensed form the recommendations on natural resources policy of 22 Federal agencies. NSRB endorsed the Paley Report's approval of the principle of percentage depletion, but took the position that a thorough study should be made "to provide both a basis for judging the desirability of percentage depletion per se, and the criteria for equitable dispensation of the privilege." NSRB also called for further study on the question of whether the expensing of mineral exploration costs should be liberalized, "as it is closely related to the question of percentage depletion." The report called upon the President to appoint a committee, including representatives of the Departments of Interior and Treasury and DMPA, to study percentage depletion as an incentive device applicable to the mining industry.

Other recommendations made by the Board were: (1) that the Interior Department draw up a coal research and development program; (2) that it develop a program for evaluating the minerals and energy position and prospects of the U. S. and the Free World; (3) that the topographic and geologic mapping of the U. S. be accelerated, with emphasis on areas of probable mineralization; (4) that the Interior Department submit a plan to Congress for the establishment and maintenance of a national system of libraries of core samples and geologic evidence; (5) that legislation be drafted to provide financial assistance to small mining operations for ex-

Washington Highlights

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CONGRESS: Convened January 3.

TAX: Hearings in April.

NSRB: Recommendations on Paley Report.

WAGE STABILIZATION: Public members carry on.

URANIUM: AEC acts on claim problem.

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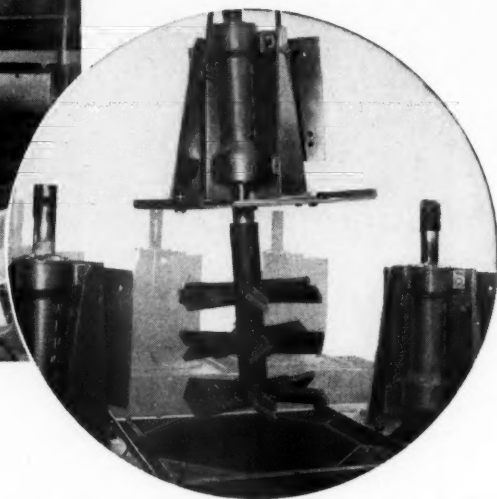
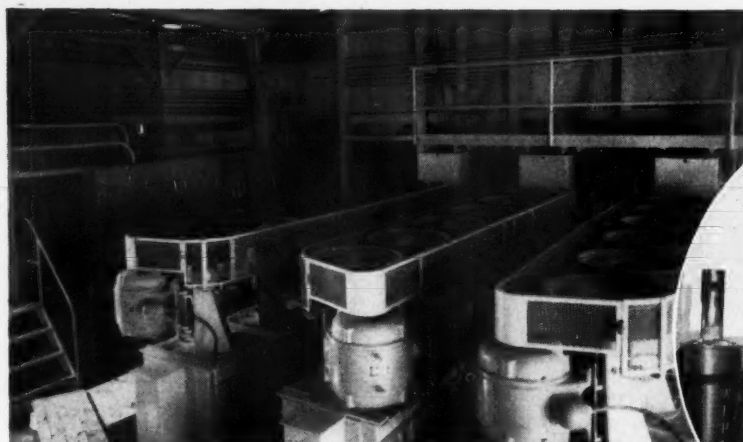
ploration and development purposes; (6) that the Atomic Energy Act be amended to permit industrial use of atomic energy; (7) that Congress authorize the St. Lawrence Seaway and power project; (8) that new legislation be enacted permitting the President to reduce or eliminate import tariffs on raw materials that are not plentiful in the U. S.; (9) that the mining laws be revised to permit prospectors to lease deposits on Federal lands as well as to acquire them under the present system of claims; (10) that the Buy American Act be repealed; (11) that governmental financial assistance be given to private industry to undertake production of oil from shale; and (12) that a census of mineral industries be made in 1954 and every five years thereafter.

The report brushed aside recommendations of the Defense Materials Procurement Agency and recommended changes in the "obsolete and anachronistic" mining laws, calling upon the Department of Interior to draft legislation implementing the recommendations of the Paley Report.

Wage Stabilization

Since the President overruled the Wage Stabilization Board in the coal mine wage case, he has been unable to persuade new men from industry to serve on the Board. Failing in his efforts, he took action on December 13 by placing Economic Stabilizer Roger Putnam in charge of wage control.

(Continued on page 63)



Get Higher Recovery— Improved Quality— with the **WEMCO ATTRITION MACHINE**

Here is a **new** machine that gives you an economical—a **profitable** solution to two important problems:

- 1** Efficient processing of ores and industrial sands having excessive surface coatings.
- 2** Liberation of cemented materials.

If either of these problems exists in your operations, the WEMCO ATTRITION MACHINE will give you improved quality of your product or higher recovery at a given quality.

RECOVERIES INCREASED AS MUCH AS 3 TIMES!

- Actual pilot plant tests of attritioning on the retreatment of tungsten tailings improved recovery from 22% to 68%!
- Similar tests on refloating of gold from rejects increased recovery from 20% to 65%!
- Glass sand recovery by flotation after attritioning increased from 80% to 95%!

The wide adaptability of the WEMCO Attrition Machine has been proved by actual plant operation and pilot plant tests. Here are a few examples of results obtained:

Tungsten ore—Substantial improvement of flotation grade and recovery in the retreatment of former tailings.

Uranium ores—Liberation of uranium minerals in the cementing material of sandstone.

Glass sand production—Removal of iron oxide stain to meet market specifications.

Aggregate and sand production—Disintegration of sand and clay cementing material from aggregate, saving both aggregate and sands for marketing.

Sulfide ores—Removal of semi-oxidized coatings, making possible flotation recovery—by removal of reagent and oxide coatings on former tailings.

PRINCIPLE OF OPERATION

By controlled turbulence of high density pulps, the WEMCO Attrition Machine thoroughly abrades mineral and ore particles. The imparted action is decidedly more efficient and complete than similar treatment previously attempted by other methods. Power consumption is greatly decreased, averaging 3½ to 7 kw. per ton of capacity. Maintenance and replacement costs are lowered to approximately 1 cent per ton of output.

APPLICATIONS

Treatment of Particle Surfaces

Removal of oxidized coatings
Elimination of slime coatings
Removal of reagent coatings
Surface polishing of particles

Liberation of Cemented Minerals

Ores and industrial minerals of this type may be separated, either the particles or the cementing material being recoverable for valuable mineral content.

Write today for full information on this **new** metallurgical tool and on WEMCO's facilities for conducting laboratory tests on **your** ore dressing or Sand preparation problem.

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Cone Separators • Drum Separators • Fagergren Laboratory Units • Agitators
Fagergren & Steffensen Flotation Machines • Hydroseparators • S-H Classifiers
HMS Laboratory Units • Dewatering Spirals • Thickeners • Conditioners • Densifiers



Personals

Robert C. Stephenson has recently resigned as Assistant State Geologist of Pennsylvania to accept a position in the mineral division of Woodward & Dickerson, Inc., Philadelphia, an import-export firm handling raw materials.

George H. Love, president of Pittsburgh Consolidation Coal Co., announced that the company's Board of Directors has accepted with regret the resignation of **George M. Humphrey** as a member and chairman of the Board.



G. M. Humphrey

Mr. Humphrey was recently named Secretary of the Treasury in President-elect Eisenhower's new cabinet.

The directors expressed their appreciation to Mr. Humphrey for his part in the formation of Pittsburgh Consolidation Coal Co. and for his great help in the early planning of the business and its conduct during the past seven years.

At the same time, Love announced two executive promotions. **G. A. Shoemaker** has been advanced from the



G. A. Shoemaker



S. M. Cassidy

position of vice-president to the office of executive vice-president.

S. M. Cassidy has become a vice-president of the parent company with headquarters in Pittsburgh, effective immediately. In addition to his new duties, he will continue to serve in his former capacity as president of the Consolidation Coal Co. (Ky.) Division.

The board of directors of the U. S. Smelting Refining and Mining Co. recently elected **J. D. Crawford** vice-president and general manager of Alaskan operations and **C. G. Rice** vice-president and general manager of oil operations. Rice was also elected a member of the board of directors to fill the vacancy caused by the resignation of **Samuel H. Marshall**.

Harold L. Price, former Glen Alden superintendent at Audenried, Pa., has taken over the Eagle Colliery at St. Clair. He will operate the colliery under the name of the Price Coal Co.

Stephen Rodman, recently with the Duluth offices of Oglebay Norton & Co., is now supervisor of training and industrial relations of the Montreal Mining Co., Montreal, Wis.

Clyde W. Hall, president of United Clay Mines Corp., Trenton, N. J., has retired as president and been named chairman of the board.

Five major changes in the top management of United States Steel were made at a meeting of the Board of Directors in New York on November 23.

Clifford F. Hood, a former Illinois farm boy, was elected president of the corporation, and a member of the Board of Directors. He also becomes a member of the Finance Committee. Fairless will continue as chairman of the board and chief executive officer of the corporation.

Robert C. Tyson was elected vice-chairman of the Finance Committee and a member of the Board of Directors and of the Finance Committee of the corporation. He will also continue as comptroller.

Harvey B. Jordan was elected executive vice-president-operations of the corporation.

Walter F. Munford was appointed president of the American Steel & Wire Division of United States Steel.

Howard E. Isham was elected vice-president and treasurer of the corporation. He succeeded **Max D. Howell**, who retired.

As previously announced, United States Steel Co. merged into the United States Steel Corp. at the beginning of 1953, when the parent company became primarily an operating company.

A. S. Wilson, vice-president of the Boone County Coal Corp. has announced the appointment of **E. H. Greenwald** as general manager and **T. W. Cline** as superintendent of the company's properties at Sharples, W. Va. Greenwald has been with the company since graduation from the University of Pittsburgh, serving in various engineering, production and managerial capacities. Cline was general mine foreman before his promotion.

J. F. Wolff, Sr., former general mining engineer for the Oliver Iron Mining Division, U. S. Steel Co., recently retired as engineering consultant for that company and entered a private consulting mining engineer and geologist practice. He is located at 1515 Vermilion Road, Duluth, Minn.

Alabama By-Products Corp. announced the promotion of **William C. Chase**, formerly general superintendent of mines, to the position of executive assistant and general mining consultant, and the promotion of **Henry J. Hager**, formerly assistant gen-



W. C. Chase



H. J. Hager

eral superintendent of mines, to the position of general superintendent of mines.

Chase has been general superintendent of Mines for Alabama By-Products Corp. since 1936 and before then had been superintendent of its Bradford mine since 1928. In his early career Mr. Chase engaged in coal mining in Mexico, and came to the Birmingham district in 1913. He was active in coal mining circles in the district before coming to Alabama By-Products in 1928.

Hager has been with Alabama By-Products since 1931. He has been superintendent of various mines of the company and was made assistant general superintendent in 1947.

Frank N. Marr, president of Spokane-Idaho Mining Co. and chairman of the mining bureau of the Spokane Chamber of Commerce was elected president of the Northwest Mining Association at the recent annual convention of that organization. He succeeds **E. C. Stephens**, mining geologist in charge of Anaconda Copper Mining Co.'s exploration office in Spokane.

—Obituaries—

John J. Forbes, director of the U. S. Bureau of Mines, was recently awarded the highest honor of the Department of the Interior, its Distinguished Service Award, in recognition of his public service and accomplishments in the Bureau of Mines.

A. Roy Reed, formerly with Eimco Corp., is now mine superintendent for the Lepanto Consolidated Mining Co.

George W. Moyers has been elected vice-president in charge of the Phosphate Division of International Minerals & Chemical Corp. Moyers replaces **Franklin Farley**, who resigned.

E. R. Cooper, manager of mines, Jones & Laughlin Steel Corp., has been named general manager of coal mines for the company. Cooper was general superintendent of J&L's Vesta-Shannopin Division before becoming manager of mines in 1947.

G. D. MacDonald, former superintendent, Iron Mountain Mine, has assumed new duties as general superintendent of iron mines for Columbia Iron Mining Co., U. S. Steel subsidiary.

N. I. Heaton, former general foreman at Iron Mountain, has been named superintendent.

R. F. Loer, former chief engineer at Cedar City, is now superintendent of Columbia mining operations at Desert Mound.

Frank S. Follansbee, chief engineer, Pittsburgh Coal Co., Div. of Pittsburgh Consolidation Coal Co., retired November 1. From 1923 until he joined Pittsburgh as chief engineer in 1938, he was chief engineer for the Koppers Coal Co.

Foote Mineral Co. has announced the addition of **Dr. J. F. Haseman** to its research and development staff at Berwyn, Pa. Dr. Haseman will head up a group which will study the field of mineral separation and processing dealing with lithium ores and the various by-products of Foote's King's Mountain, N. C., and Sunbright, Va., operations.

The Pocahontas Fuel Co. Inc. has announced the appointment of **Arthur J. McBride** as assistant vice-president of sales with offices in New York. McBride will assist **Anthony H. Collins**, who is vice-president and manager of sales for the company.

Richard F. Moe has resigned his position as general mine superintendent with the St. Louis Smelting & Refining Co. to accept a position as mine superintendent and **Robert C. Wilson**, formerly assistant general superintendent for the El Paso Smelting Works, El Paso, Tex., has been appointed smelter superintendent for the White Fine Copper Co. in Michigan.

Lucien Eaton, 73, passed away on December 9 at Milton, Mass. His death brought to a close a long and distinguished mining career which began in 1902 when he joined the Cleveland Cliffs Iron Co. at Ishpeming.



After 27 years on the Iron Ranges, he went into consulting practice.

From then on his work took on a global character. His activities spread over North, South and Central America, Australia, Russia and China.

He invented an anvil block and chuck for drifter drills; developed special shaft sinking equipment and was the author of a standard text on mining—"Practical Mine Development and Equipment."

Mr. Eaton also found time for technical societies and industry organizations. He served as American Mining Congress representative on the Mining Standards Committee of the American Standards Association and was for some years chairman of that committee.

His personality, together with his many contributions to the art and science of mining, have made a lasting imprint on the industry.

Oscar Dalton, construction superintendent of the Tennessee Copper Co., died in M'Caysville, Ga., on November 22. Mr. Dalton was 68 years old and had been employed by the Copper company for the past 42 years.

Helbert F. Nelson, 60, chief electrician for Day mine properties since 1928, died in early December in Wallace, Idaho.

Mr. Nelson was born in Ironwood, Mich., and came to the Coeur d'Alene in 1919, working as an electrician from that time until 1925 at the Gold Hunter.

Carroll B. Huntress, 67, vice-president of Republic Coal and Coke Co., died in late November at his home in Mt. Vernon, N. Y. He was a leading opponent of the proposed St. Lawrence Seaway and at the time of his death was chairman of the National St. Lawrence Project Conference.

Mr. Huntress began his business career as a newspaper man and Chamber of Commerce executive. He came to Washington as the representative of the National Association of Owners of Railroad Securities. From 1924 to

1934 he was with National Coal Association, the last four years of that period as executive secretary. From 1934 to 1936 he served as president of Appalachian Coals, Inc., from which position he went to New York.

Francis A. Bell, a vice-president of The Cleveland-Cliffs Iron Co., died December 11 in Lakeside Hospital, Cleveland, after a month's illness.

Mr. Bell, a native of northern Michigan, was born in Negaunee on January 4, 1906. After completing his secondary education in local schools, he went to the University of Michigan, and after graduation from Arts College he entered the University's law school, following his graduation from which he joined the law firm of Berg & Clancey, in Ishpeming, Mich. in 1931. He was admitted as a partner in the firm in February, 1939. In July, 1952, Bell joined The Cleveland-Cliffs Iron Co. as a vice-president, moving to Cleveland shortly thereafter.

Ward Tuttle, 43, died on November 30. At one time field supervisor for the U. S. Employment Service he became regional director for the War Manpower Commission in Salt Lake City in 1942. In 1946 he joined the staff of U. S. Smelting Refining and Mining Co. as assistant manager of industrial relations. He was named personnel manager for Southwest Potash in 1951 and was industrial relations manager for that company at the time of his death.



Charles J. Parry, manager of the mining department of J. A. Hogle and Co., passed away in early December.

Joseph Francis Fleischut, 67, retired administrative officer of the U. S. Bureau of Mines Health and Safety Division, died recently in Washington. He had retired in 1951 after 42½ years with the Government.

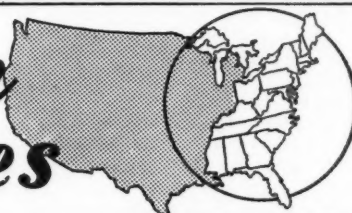
Alexander W. Laing, vice-president of the Wyatt Coal Co., passed away at his Charleston, W. Va., home on November 15. His many years of business activity made Mr. Laing well and favorably known in the coal and lumber industries. He and his brother, John Laing, who founded the Wyatt Coal Sales Co., cooperated actively for many years in the production and sale of coal from the Kanawha and New River-Winding Gulf fields.

NEWS

and VIEWS



Eastern States



Uranium Meeting in Tampa

A classified conference on problems of uranium recovery from phosphate rock was held December 8 and 9 in Tampa, Fla., under the sponsorship of AEC's Division of Raw Materials. About 100 attended, including representatives of 18 companies and eight laboratories working on uranium recovery from phosphate rock. Members of the Advisory Committee of the Raw Materials Division and AEC staff members were also present. The meeting was closed to the public. On the day following the meeting, the group visited the uranium recovery pilot plants now operating in the area.

Companies Merge

National Lead Co. and Doehler-Jarvis Corp. have agreed to a merger, subject to approval of Doehler-Jarvis stockholders at a special meeting on or after January 30, 1953.

National Lead is the biggest producer of lead paints and pigments in America and Doehler-Jarvis is the

nation's largest producer of non-ferrous metal die-castings and an important manufacturer of ornamental and general hardware.

Doehler-Jarvis has eight plants—two at Toledo, Ohio; two at Grand Rapids, Mich.; two at Batavia, N. Y.; and one each in Chicago, Ill., and Pottstown, Pa.

CMIA Meeting

The oldest coal mining institute in the United States held its annual meeting in Pittsburgh, Pa., on December 11 and 12. The Coal Mining Institute of America was organized in 1887 and the most recent meeting was its sixty-sixth annual meeting.

New officers of the organization are: H. P. Greenwald, U. S. Bureau of Mines, president; J. J. Snure, Rochester and Pittsburgh Coal Co., first vice-president; W. G. Stevenson, Hillman Coal and Coke Co., second vice-president; and T. G. Ferguson, Pittsburgh Coal Co., Div. of Pittsburgh Consolidation Coal Co., third vice-president.

The annual banquet, held in the William Penn Hotel on Thursday evening, was addressed by Tom Pickett, executive vice-president, National Coal Association. The subject of his talk was "Coal, Competition and Congress." M. D. Cooper, director, Mining Engineering Education, National Coal Association, served as toastmaster at the banquet.

The technical sessions attracted great interest and were well attended.

Wilbur A. Haley, Mining Engineer, U. S. Bureau of Mines, gave a paper on longwall mining with the Loebbe coal planer at the Thursday morning session. Steve Krickovic, chief engineer, Eastern Gas and Fuel Associates, discussed Mr. Haley's paper. At the afternoon session, W. W. Dartnell, superintendent, Gibson Mine, Hillman Coal & Coke Co., talked about arches for main haulage timbering. The rest of the afternoon was taken up by a three-man panel, which discussed roof-coating materials for underground mines. Michael J. Garnek, mine inspector, Bituminous Div., Pennsylvania Department of Mines; L. B. Berger, chief, Health Branch, U. S. Bureau of Mines; and J. S. Schrecengost, chief engineer, Allegheny River Mining Co., formed the panel.

Papers at the Friday morning session were devoted to roof-bolting and auxiliary functions. D. C. Ridenour, chief engineer, Olga Coal Co., discussed "Economics of Pin Timbering of Hard Rock Roof." "Roof-bolting in the Bituminous Coal Mines of Pennsylvania" was the title of a paper by

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George J. Steinheiser, mine inspector, Pennsylvania Dept. of Mines. Harold E. Shomper, mine inspector of the Pennsylvania Dept of Mines spoke on "Roof-bolting in the Anthracite Coal Mines of Pennsylvania." The last paper on the morning program was one by L. B. Berger, U. S. Bureau of Mines on "Types of Dust Collectors Used in Conjunction with Roof Bolt Drilling."

One paper at the Friday afternoon session was devoted to personnel training. R. B. Hewes, Associate Professor, In Charge Supervisory Training, The Pennsylvania State College, spoke on "Supervisory Training of Mine Officials."

The rest of the afternoon was devoted to a panel discussion of "Stream Pollution from Mine Refuse." Members of this panel were Clyde Maize, Pennsylvania Dept. of Mines; L. S. Morgan, Pennsylvania Dept. of Health; and S. A. Braley, Mellon Institute of Industrial Research.

Nickel in 1952

The accelerated expansion of existing production facilities and the advent of new and potential producers were the 1952 highlights of the free world's nickel industry, Dr. John F. Thompson, chairman of the Board of Directors of The International Nickel Co. of Canada, Limited, said recently in a year-end review.

Dr. Thompson estimated that the free world output of nickel will approximate 315,000,000 lb this year, compared with 295,000,000 lb in 1951. Canadian production will be approximately 280,000,000 lb, or about 90 percent of the total. The free world production of nickel is believed to be over five times that of the rest of the world.

35-Mile Coal Pipe Line Studied

A new firm, Hydrocoal Transportation Co., has been organized by the Mahoning Valley Industrial Council, a Youngstown manufacturers association, to study the possibility of building a coal pipeline from East Liverpool, Ohio, to Youngstown. This is a distance of approximately 35 miles. Several large steel companies are showing great interest in Hydrocoal's studies.

Engineering data on pipeline transportation of coal has been collected from an experiment at Georgetown, Ohio, which ended late this year. Pittsburgh Consolidation Coal Co. conducted these experiments using a three-mile pipeline. One of the major problems of the undertaking would be the drying of coal at its destination.

Present studies indicate that 50 cents to a \$1 a ton could be saved on transportation charges of coal from East Liverpool to Youngstown.

Summer Camp Story

Nearly 1000 youngsters from homes of Eastern Gas and Fuel Associates employees attended the 1952 summer recreation camps conducted by the mining organization.

More than 12,000 boys and girls have attended the camps since the first summer session was held in 1935. During 1952 there were 789 white children at Camp Thomas E. Lightfoot, near Hinton, W. Va., and 141 negro children at Camp Washington-Carver, near Beckley, W. Va.

The camps are operated by Eastern Gas and Fuel Recreation Camps, Inc., a non-profit corporation.

List Gasification Publications

A complete listing of publications and articles on coal gasification—a process of converting coal into a synthesis gas to produce liquid fuels—was released recently as a circular by the U. S. Bureau of Mines, Department of the Interior.

The bibliography lists approximately 400 references to the over-all study of gasification, but does not abstract or evaluate them. It was prepared by Robert M. Busche and Howard R. Batchelder, Bureau chemical engineers stationed at the Synthetic Liquid

Fuels Demonstration Plants, Louisiana, Mo., and William P. Armstrong, associate professor of Chemical Engineering at Washington University, St. Louis, Mo.

A free copy of "Report of Investigations 4926—A Selected Bibliography of Coal Gasification," can be obtained from the Bureau of Mines' Publications—Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

U. S. Steel Projects

In a year-end statement, Benjamin F. Fearless, chairman of the board, United States Steel Co., reported that the Orinoco Mining Co. is expediting installation of loading facilities at Cerro Bolivar and ore shipments from Venezuela are expected to start early in 1954. The vessel dock at Puerto Ordaz is now in operation, facilitating construction of railroad, highway and material handling equipment. At year end, the project was 30 percent completed.

At Universal, Pa., the first of a three-step program to completely replace Universal Atlas Cement Co.'s plant was five percent completed. The new plant will incorporate facilities designed to eliminate objectionable smoke inherent in the operation of the existing plant.



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AIME Honors Engelmann

The Robert H. Richards award of the American Institute of Mining and Metallurgical Engineers will be presented to E. W. Engelmann, assistant general manager, Utah Copper Division, Kennecott Copper Corp., according to information received from the Institute's New York headquarters by Roy E. O'Brien of Salt Lake City, field secretary.

The Richards award was first established by the Institute in 1947 to recognize "achievement in any form which unmistakably furthers the art of mineral dressing in any of its branches."

The award will be formally presented at the annual meeting of the Institute in February 1953 in Los Angeles. The recipient was selected by a Committee of Institute members imminent in the mining and educational fields. The award to Engelmann will be made "for his outstanding accomplishments in advancing the technique of the metallurgy and beneficiation of copper ores."

Engelmann's first job with Utah Copper in 1911, after graduating from the Missouri School of Mines, was on the cleanup gang at the Magna plant.

Subsequently, he was a mill operator in various departments of the plant and did metallurgical statistical work. Afterwards, he engaged in flotation experimental activities and was transferred to the Ray Consolidated Copper Co. at Hayden, Ariz., as flotation foreman where he spent four years.

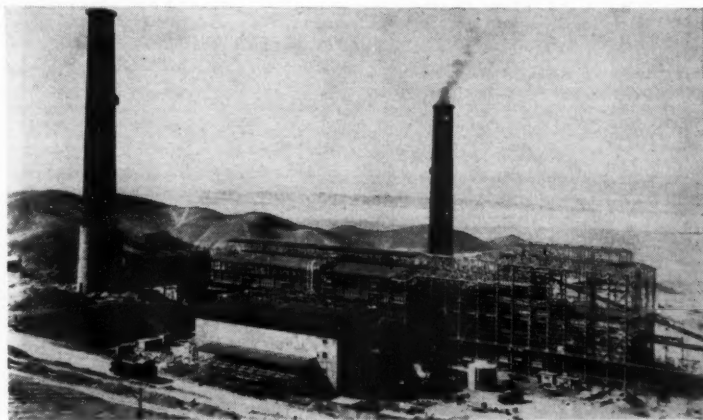
In 1918, following his work in Arizona, he was appointed consulting flotation engineer for all properties operated under the direction of D. C. Jackling. During the period until 1922 he supervised the development for recovery of minerals by flotation at the Utah Copper, Nevada, New Mexico, Montana and Arizona properties of Kennecott Copper Corp. He also took an active part in making flotation demonstrations before the various Federal Courts throughout the United States in litigations between various mining companies and the Minerals Separation Co.

During this period he also was sent to the Braden Copper Co. at Sewell, Chile to improve their milling and metallurgical practice where he developed some flotation reagents for use in their flotation plant. In 1923, Engelmann returned to Utah as superintendent at the Magna plant where he had first started to work 12 years

First Blister Copper Arrives

The first shipment of blister copper derived from the vast copper sulphide ore reserves of Chile Exploration Co.'s open-pit copper mine at Chuquicamata arrived in New York December 2, aboard the Grace liner

copper production has been derived from the oxide type ores which were treated by leaching and electrolyzing. The blister copper now being produced from sulphide ores at the new Chuquicamata plant will be electrolytically



Santa Cecilia. The announcement was made by C. F. Kelley, board chairman of Anaconda Copper Mining Co., parent organization of the Chile Company.

Mr. Kelley stated that the new sulphide plant, which has been under construction since late 1948, is being placed in operation and that the first blister copper was produced from the smelter on November 5. Until now,

refined by the company's subsidiary, International Smelting & Refining Co.'s Raritan Copper Works at Perth Amboy, N. J.

The new sulphide plant at Chuquicamata, together with the oxide plant which will continue in operation, is expected to attain an ultimate combined capacity of not less than 500,000,000 lb of copper per year.

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THE OHIO MINING CO.
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before. In 1938 he was named general superintendent of mills and had operating supervision of both the Magna and Arthur plants until December 1948 when he was appointed to his present position at Utah Copper.

Study Alabama Coal

Professor R. Q. Shotts, School of Mines, University of Alabama, has completed a survey of the steam coal reserves of Alabama, for the Tennessee Valley Authority. The T.V.A. is building several large steam plants in order to serve the ever-mounting power load of this area.

Drive 13 Tunnels in Peru

A large irrigation project, which includes 13 tunnels, is now being constructed by the Peruvian government at a cost of \$8,000,000. The project will divert vitally needed water from the Quiroz and Chipillico Rivers to the Piura River, and will supply water for irrigating 75,000 acres of land in the cotton raising Department of Piura, and will also provide for the reclamation of an additional 50,000 acres of arid land.

The Culqui Tunnel, the longest on the project, was recently holed through after nearly a year of tunneling in hard granite. The 16,500-ft Culqui Tunnel was driven in three headings. Progress averaged about 35 lin ft per day in each heading, with the greatest advance in one week being 270 ft in one heading. Drifting drills manufactured by the Gardner-Denver Co. of Quincy, Ill., were used to push the project.

Scheduled to be completed early in 1954, the big Quiroz project is being carried out by Morrison-Knudsen Co. In addition to the Culqui Tunnel, four others have been completed and work has been started on the sixth tunnel.

Total length of the irrigation supply system is about 52 miles, of which nearly six miles are tunnel. Water will also be carried 22 miles through natural stream channels and 24 miles in open canals.

Increase Zinc Capacity

Tennessee Coal & Iron Division of U. S. Steel is approximately doubling the capacity of its Jefferson City, Tenn., zinc works. The Jefferson City plant is presently processing about 1100 tons of raw ore and turning out some 66 tons of zinc concentrates a day.

Crozer Coal Acquires Turkey Gap

Operations of the Turkey Gap Coal and Coke Co. at Dott, W. Va., have been acquired by the Crozer Coal and Land Co. The Turkey Gap Co. will be liquidated and absorbed as a division of the Crozer Co. W. E. McQuail will continue as general manager of mines at Dott.

Bible Aids In Copper Find

The State of Israel will extract 100,000 tons of copper ore from the ancient site of King Solomon's Mines within the next seven months, it was predicted recently at a press conference held in New York by Abraham Dor, chief engineer of Israel Mining Industries. Mr. Dor arrived here recently for a nation-wide speaking tour on behalf of the \$500,000,000 State of Israel Bond Issue now being subscribed in this country.

"Clues which led to the discovery of the ancient mines and the production of copper in Israel for the first time since Biblical days," he said, "came from passages in the Bible and from modern archaeological research."

BCR Board Meets

At its annual budget meeting in Pittsburgh on December 10, the Board of Directors of Bituminous Coal Research, Inc., authorized the operation of an industry-research laboratory.

The BCR Board of Directors instructed the officers to lease a building in Columbus, Ohio, to house the Columbus staff of the organization and provide facilities for design, development, and pilot-plant testing of equipment and processes being investigated under BCR's General Research Program.

Dr. A. A. Potter, president of the national research agency of the bituminous coal industry, reports that the Board of Directors outlined four major divisions of research effort for the coal industry's cooperative program during 1953. Research will be conducted to increase user satisfaction in the following markets: (1) residential and agricultural, (2) commercial and small industrial, (3) general industrial, including utilities, and (4) gasification, carbonization, and chemicals from coal.

Some technical activities of the industry's research agency will be

continued at a somewhat reduced rate to permit greater attention on the four principal project divisions. Research on coal-burning equipment for residential, agricultural, commercial, and small industrial uses will be intensified.

Dr. Potter also announced the election of Julian E. Tobey, president of Appalachian Coals, Inc., of Cincinnati, to the Board of Directors of Bituminous Coal Research, Inc.

Call Conservation Conference

A citizens' conference on the conservation and development of natural resources to be held in Washington in cooperation with the White House next March—the first of its scope since 1908—was announced November 13 by Horace M. Albright, president of Resources for the Future, Inc., a new non-profit corporation established to support education and research in this field.

President-elect Dwight D. Eisenhower has declared his intention to join in the call for the citizens' conference, and President Harry S. Truman has offered his cooperation and that of the Government in the interval before the new administration takes office.

"It is high time," Mr. Eisenhower stated, "that the conservation conference of 1908 should be reborn in a mid-century setting. I shall be glad to issue or join in an appropriate call of a conference to consider the subject of resources for the future, and to ask the cooperation of governmental and private agencies in the preparations for and conduct of the conference meetings."

In pledging White House support in preparing for the conference, Mr. Truman stated, "Your organization will indeed be rendering a public service in the finest tradition by providing a forum for the discussion of issues in the resources field. . . ."

The non-profit corporation which will organize and conduct the conference, Mr. Albright said, will undertake "long-range programs of research and education to assure the resources essential to the progress, vigor, and security of the Nation."

Officers of Resources for the Future, Inc., are: Mr. Albright, president; Charles W. Eliot, executive director, and Elmer A. Hennig, secretary-treasurer. Offices of the new organization will be at the Cafritz Building, 1625 Eye Street, Washington, D. C.

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2—300 KW West. Syn. 275 V 1200 RPM

3—200 KW G.E. Syn. 275 V 1200 RPM

These are 3 phase, 60 cycle, 2300/4000 volt, complete with switchboards and full automatic AC and DC switchgear.

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2—20-ton Jeffrey, MH-77

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2—15-ton West. 908-C

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2—13-ton G.E. HM-829

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2—13-ton Jeffrey MH-110

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2—6-ton Jeffrey MH-88

Complete with new Jeffrey steel strip resistances. All

have been rebuilt and any part showing any wear was

replaced with new. Guaranteed 100 per cent against

electrical and mechanical defects.

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booms, shaker screens, rescreening plant, equipped

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PERMISSIBLE TYPE, 250 V DC

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Industrial Hygiene Meeting

More than 600 leaders in the industries and the professions are expected at the 17th Annual Meeting of Industrial Hygiene Foundation at Mellon Institute, Pittsburgh, Pa., on November 19 and 20.

At least 350 member companies of the Foundation will participate in medical, engineering, chemical-toxicological, legal and joint medical-legal conferences on the first day and in the main meeting, designed particularly for management, on the 20th. Administering arrangements for the events is Dr. C. Richard Walmer, Managing Director of Industrial Hygiene Foundation.

Keynote speaker at the main meeting will be L. R. Boulware, vice-president, General Electric Co. He will depict the duty of industrial hygiene specialists to contribute to industrial health in the broadest sense—through professional channels and through wider practice and promotion of good citizenship activities.

Following the keynote address will be a panel discussion on "Contributions to Worker Health," in which representatives from the medical, chemical, engineering and legal professions will discuss the roles their specialized fields play in promoting worker health.

"Noise in Industry," "Review of Latest Developments in Outdoor Air Pollution," and "Management Education and Worker Health" are topics to be presented at the afternoon sessions of the main meeting.

The technical conferences on the opening day will be attended by specialists in industrial medicine, law, engineering, chemistry and toxicology.

Andrew Fletcher, president of St. Joseph Lead Co., chairman of the board of trustees of the Foundation, recently stated that, in addition to the satisfactory returns in dollars as well as in human happiness that an industrial health program brings, "our country's first line of defense is the health of its citizens, especially that of the workers in the industries."

One Billion Tons of Steel

United States Steel poured its one billionth ton of steel at Homestead, Pa., on November 26. No other company in history and no other nation on earth has ever equalled this production record.

It took 51 years, 7 months and 25 days and the combined efforts and ingenuity of tens of thousands of men, and women, too, for the Corporation's mills to become the first in the history of world steelmaking to reach a billion tons. If it were possible to maintain today's greatly-accelerated pace it would take only 30 years to produce the second billionth ton in the present mills of U. S. Steel, which represent only about one-third of the steel in-

dustry in this country. A billion tons of steel represents 36 and one-half tons produced every minute since 1901—day and night.

It takes men and women with approximately 1,000 different skills, professions and arts to produce a ton of steel today. It took U. S. Steel 21 years to reach its first third of a billion tons of steel, 19 years to reach the second third of a billion, and slightly less than 12 years to produce the remaining third. The Corporation today is producing three and one-half tons of steel for every ton it produced 50 years ago.

A billion tons of steel is enough to build a bridge with a 22-ft roadway around the earth $7\frac{1}{2}$ times at the equator, or stretch a piano wire from the earth 13 times up and back to Pluto, the most distant planet in the solar system—86 billion miles away, or if rolled into standard 18-gauge sheets 18 in. wide to reach the sun 90 million miles away, or instead of an iron curtain—had we ever needed or wanted one—this billion tons could have built a solid steel wall ten ft high, $4\frac{1}{2}$ ft thick, and nearly 18,000 miles long around the entire perimeter of the United States.

A billion tons of steel is more than twice as much steel as Russian mills have produced in their entire history.

New Coal Mine Planned

Alabama By-Products Coal Co. is planning to open a modern 5000 tpd coal mine near Gorgas, Ala. The coal is to be used by the Alabama Power Co. for its new generating facilities being built near Mobile.

Report on Zirconium Tests

Results of numerous miscellaneous high-temperature experiments with zirconium and zirconium compounds conducted by the Bureau of Mines, United States Department of the Interior, are presented in detail in a report released recently by Bureau Director J. J. Forbes.

The report describes early tests made in connection with the Bureau's recent development of an economical method of producing ductile zirconium. Most of the information it contains may be applied with virtually no change to problems involved in producing another of the newer metals, titanium.

Among the many problems investigated by Bureau metallurgists and described in the present report are: The decomposition of zircon to produce anhydrous chloride; the direct production of alloys; plating of pure zirconium and zirconium alloys on various metals; and the behavior of zirconium compounds at elevated temperatures in various gaseous media.

The report was written by W. J.

Kroll and A. W. Schlechten, former Bureau metallurgists, and W. R. Carmody, former Bureau electrochemist at the Northwest Electrodevelopment Laboratory, Bureau of Mines, Albany, Ore. It contains a bibliography of literature on zirconium, and appendix describing experiments with a method that employs chlorine for oxygen determination in zirconium, eight tables, and five illustrations.

A free copy of Report of Investigations 4915, "High-Temperature Experiments with Zirconium and Zirconium Compounds," may be obtained from the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. It should be identified by number and title.

Wheels of Government

(Continued from page 55)

Putnam promptly placed control in the hands of the Wage Board's four public members, who are under the new WSB Chairman Charles Killingsworth. On December 16 came the resignation of Putnam followed by the reinduction of former OPS Administrator DiSalle in his place. The WSB has a heavy load of some 12,000 wage cases pending and there is an insistent need for action.

Mining Claims—Uranium

Prospectors, mining claim locators and small miners on the Colorado-Utah plateau have been seriously handicapped by a Department of Interior ruling that no mining claim locations could be made for uranium or other mineral on the public domain in areas taken up by oil and gas leases, or covered in applications for such leases.

The Atomic Energy Commission has now announced a solution of this problem, under which the uranium miners may execute a lease with the AEC on such lands, giving them the right to produce and sell uranium ore.

The AEC states that, "A lease agreement with the AEC, representing the Federal Government, will remain in effect for so long as the lessee sustains with reasonable diligence, skill and care, a program of prospecting and exploration, development and mining of the uranium deposits in the leased premises so as to achieve and maintain maximum production of uranium ore consistent with the size of the deposit and good mining practice. Lessees are required to fulfill certain requirements which include keeping the Commission informed of their activities and to conduct the operations in such a manner as not to interfere with the lawful operations of any third party having an interest in the premises such as oil and gas lessees."

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should have a nest egg"***

FREDERICK C. CRAWFORD
President, Thompson Products, Inc.



"That nest egg can be in the form of U. S. Defense Bonds—a patriotic equivalent of cash. Defense-bond dollars grow. Americans who enroll in the Payroll Savings Plan become shareholders in Uncle Sam, Inc. With their chips in the game they are helping the country to deal with problems of finance and inflation. As investors in the nation they are more apt to vote for wise government policies to safeguard their investment."

Certainly every American should have a nest egg—and millions of them will: over 7,000,000 employed men and women, enrolled members of the Payroll Savings Plan, are putting aside approximately \$150,000,000 per month in the improved U. S. Defense Bonds.

And there is no safer, better way to make dollars grow: the cash value of Series E Bonds held by individuals on December 31, 1951, amounted to \$34.8 billion—\$4.8 billion more than the cash value of Series E Bonds outstanding in August, 1945.

Employers, too, benefit from the Payroll Savings Plan: the Payroll Saver is a serious worker. He thinks twice before he takes a day off—he's mindful of the effect on his take-home savings. He's a more careful worker—he wants to keep off the accident list. Records

show that as employee participation increases, absenteeism and "Lost Time Accidents" decrease and the production curve goes up.

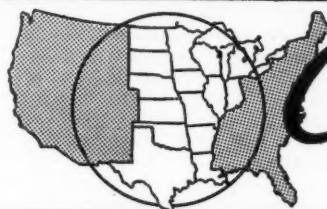
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If your percentage is less than 50%, phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will explain how easy it is to conduct a person-to-person canvass that will put a Payroll Savings Blank in the hands of every one of your employees. That's all you have to do. Your employees will do the rest—they *want* to join the plan that provides for their security.

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MINING CONGRESS JOURNAL





Central States

Limestone Shipments Stop

During the period from March 24 until the week of December 12, Bradley Transportation Line of Michigan Limestone division, carried a total of 7,961,000 net tons of limestone, according to Irvin L. Clymer, president of the U. S. Steel division.

This tonnage was carried by seven self-unloaders of the Bradley Line, including the new giant of the fleet—the 666-ft steamer *John G. Munson*.

The ships were laid up almost a week earlier than in 1951, but all industries depending upon the Bradley fleet have sufficient limestone on hand to take care of maximum operation until the opening of navigation in 1953, according to Clymer.

Gulf Recovers Sulphur

A new sulphur recovery unit has been put into operation at the Gulf Oil Corp.'s Port Arthur, Tex. refinery. The unit has a daily capacity of 134,400 lb of sulphur.

New Uranium Ore Station

The U. S. Atomic Energy Commission has announced the establishment of a new ore buying station at Edgemont, S. D., for the purchase of uranium-bearing ores. The station went into operation on December 1, and is providing a market for ores produced in the Black Hills region.

Ores will be purchased under the terms of the Commission's Domestic Uranium Program Circular No. 5, Revised, if they are of the carnotite or roscoelite type, such as are found on the Colorado Plateau. When ores contain lime in excess of six percent, they will be bought under special contracts with individual producers. Other types of ore will be purchased under contracts with individual producers, depending upon the metallurgical characteristics of the ore.

It is expected that the establishment of the Edgemont station will materially aid the miners of southwestern South Dakota and northeastern Wyoming in the delivery and sale of their ores, and will stimulate exploration, development and production of uranium from this new field. The station will be operated under contract for the Commission by the American

Smelting and Refining Co., which also operates the Commission's stations at Monticello and Marysville, Utah and at Shiprock, N. M.

Record Ore Haul

American railroads hauled more iron ore since the end of the steel strike last summer than in any similar period, the Association of American Railroads reports. The apprehension that ore shortages might cause the closing of mills prior to the opening of spring navigation on the Great Lakes has been entirely allayed, according to Arthur H. Gass of the Association.

The following figures were cited: Between August 3 and November 23, a total of 1,490,934 cars of iron ore were moved, an increase of 19.3 per-

cent over the same 1951 period. The railroads moved more than 52,288,000 tons of ore from the mines in the Lake Superior region to the head of the lakes for boat shipment to lower lake points, or about 3,000,000 tons a week. Estimates are that about 75,000,000 tons of ore will have been transported down the Great Lakes since the shipping season opened in April and the departure of the last vessel from the Duluth-Superior docks.

The last ore vessels left at the end of November, and with the end of the lake shipping season, mining operations of the iron ore producers have turned from ore production to mine development, stripping and winter maintenance work.

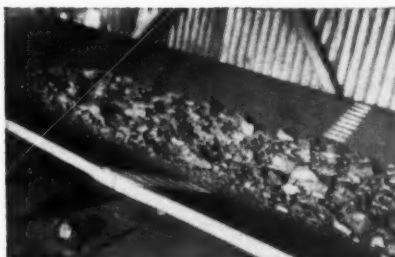
Alumina Works Expansion

Plans for a proposed major addition to Aluminum Ore Co.'s new alumina works at Bauxito, Ark. were announced recently by president Allen B. Williams.

The plant would be built to help meet defense requirements for vital alumina chemicals. It would also be part of the ore company's long-range plans for meeting anticipated growth in civilian demands for chemicals, Mr. Williams said.

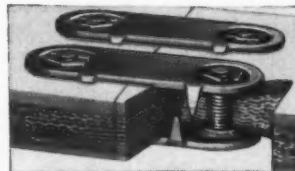


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Coal Mine Saves \$63,000

An Indiana coal mine has saved more than \$63,000 by roof bolting its main entry instead of using conventional peg timbering, the U. S. Bureau of Mines, Department of the Interior, said recently after completing a detailed study of the operation.

The bolts were installed in about 2½ miles of haulageway in the Kings Mine, Princeton Mining Co., Gibson County, Ind., and was made possible by cooperation of Placide Mayeur, superintendent of the Kings Mine, and G. F. Bieler, general superintendent of the Snow Hill Coal Corp., Terre Haute, which installed the first roof bolts used in an Indiana coal mine.

The report was prepared by L. W. Kelly, Bureau mining engineer in the Accident Prevention and Health Division, Region VIII, stationed at Vincennes, Ind., and was made possible by cooperation of Placide Mayeur, superintendent of the Kings Mine, and G. F. Bieler, general superintendent of the Snow Hill Coal Corp., Terre Haute, which installed the first roof bolts used in an Indiana coal mine.

A free copy of "Information Circular 7653—Economics through Roof Bolting in an Indiana Coal Mine," can be obtained from the Publications-Distribution Section, Bureau of Mines, Pittsburgh 13, Pa.

Falconbridge Gets Loan

A loan has been procured by the Falconbridge Nickel Mines Ltd. of Toronto from the Export-Import Bank and Defense Materials Procurement Agency to finance expansion of Falconbridge's nickel, copper and cobalt production. The Canadian concern is the world's second largest nickel producer and operates mines, mills and smelters in the Sudbury district of Ontario.

Expansion will include the deepening of the present main shaft and sinking of a new shaft at the company's Falconbridge mine, developing and equipping its new Hardy mine, and expanding the capacity of its mill and smelter.

Work at White Pine

The following interim report was released by the Copper Range Co. on December 15.

"Clearing of areas, grading and excavation for the White Pine Project in Ontonagon county, Mich., started in March of this year. Four dormitories, which can be converted at a later date into apartments, are nearing completion and will furnish housing for workers during the balance of the construction period. A cafeteria designed to accommodate 1500 persons will be completed in January, 1953. The administration building, warehouse and machine shop, vehicle repair shop, mine change and transfer

house, and the hospital will be sufficiently enclosed to allow interior work to be carried on during the coming winter. Outside construction in general will continue as long as weather permits. Earth excavation at the mine portal is completed and concreting is under way. Construction of the 14-mile spur track between Bergland and White Pine is nearing completion.

"Rehabilitation of 26 existing houses was completed during September and construction is under way on the first group of 130 family housing

units in the townsite. A substantial number of these will be finished on or about January 1, 1953, and the balance shortly thereafter. The Upper Peninsula Power Co. has completed the installation of an 18-mile transmission line from its Victoria station to White Pine and service is being provided.

"The over-all progress at White Pine has been very satisfactory and generally in accord with plans and estimates to complete the program in late 1954."

Sulphur Plant That 'Floats' in Production

Molten sulphur, mined with a plant that "floats," has begun flowing from deep beneath Bay Ste. Elaine in the remote Louisiana marshland to signal the start of production at the nation's newest and most unusual mining development.

The water-borne plant, only one of its kind in the world, was built by Freeport Sulphur Co. to mine the marginal deposit because of the prohibitive cost of constructing a permanent installation under the difficult terrain conditions. At full operation, the output of sulphur will be approximately 100,000 long tons per year, the company estimates.

Bay Ste. Elaine is one of two marshland salt domes being developed by Freeport. It lies in the bayou country about 60 miles southwest of New Orleans. Most of the area is under water. The rest is marsh.

Not only is the "amphibious" plant an innovation in sulphur mining, but the use of sea water as a mining "tool" instead of fresh water, which was not available, is entirely new. The process making this possible was developed

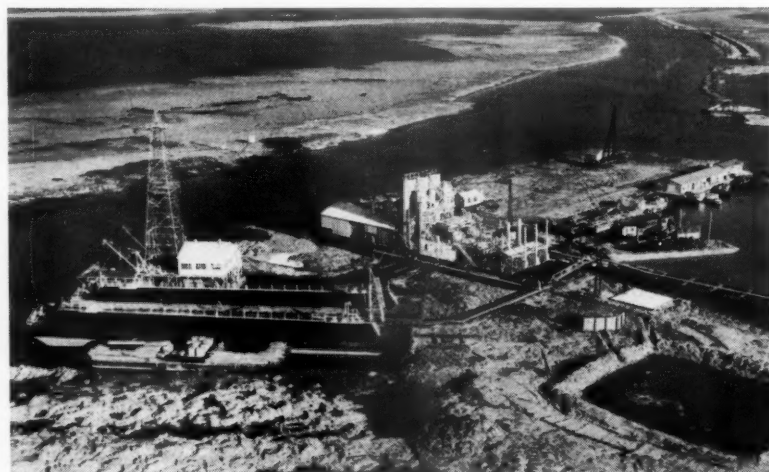
by Freeport in eight years of research.

The floating plant, on a 200-ft steel barge, was built at Grande Ecaille, site of the company's largest sulphur mine 55 miles south of New Orleans, and towed to Bay Ste. Elaine, a distance of 65 miles. It rests on an oyster shell base laid on the bottom of the bay, its deck six ft above water, anchored to piling driven deep into the earth. Shops, warehouses and offices also are built on barges.

The plant is designed to furnish nearly 2,000,000 gal of 325° F water every 24 hours. Specially-designed controls make the operation practically automatic.

Water leaves the barge-based plant in one pipeline, later branching out to the various well locations. At each well is an electrically operated valve and telemetering device regulating and registering the amount of water that enters the deposit.

The molten sulphur is pumped directly into insulated tank barges of 1000-ton capacity and transported to storage at Port Sulphur 75 miles away on the Mississippi River.



Aerial view shows the plant (center) floating drilling rig and insulated tank barges (left) used to transport the molten sulphur to storage 75 miles away. Workers commute by boat to the plant, which is only a few miles from the Gulf of Mexico

Oilmen Look For Uranium

American oilmen have a plan whereby the oil industry's billion dollar-per-year hunt for oil can become as well a hunt for scarce and vital uranium, the raw material of atomic energy. The plan has been developed at the request of the U. S. Atomic Energy Commission.

This fact was revealed by the president of one of the three professional societies of earth scientists who are developing a five-point program to ferret out radioactive minerals while the oil industry's 10,000-man army of scientifically-trained explorers are searching for crude oil.

Curtis H. Johnson, president of the Society of Exploration Geophysicists, in discussing the plan, said it is now being presented to oil companies throughout the nation by a committee of the sponsoring groups who are also informing their scientist-members about their part in the plan.

The first of its five parts is based on this fact: the principal obstacle to discovering new supplies of uranium and thorium is limited range of detection instruments.

"Six inches of earth lying over a uranium deposit cuts the chances of it ever being discovered in half," Johnson stated.

"And there's only one thousandth as much chance if there's another four feet of soil on top of the radioactive deposit."

But oil industry explorers drill over 4000 shallow test holes each day in the U. S. and Canada. The holes aver-

age 75 to 100 ft in depth, and are used for seismic testing of underground structures.

The first part of the plan, said the Geophysicists' president, calls simply for checking the material excavated from the shallow holes for radioactivity by special follow-up crews who would work behind the seismograph crews.

The other parts of the plan are:

Second, that all the material drilled out in the first 500 ft in each of the 1000 or more oil wells drilled by the oil industry all over the nation each week be checked for radioactive materials in the same manner as the materials from shallow seismic exploration holes.

Third, to encourage the thousands of surface geologists employed in the oil industry to be alert for the clues of radioactive deposits. Oil companies would be urged to equip these trained earth scientists with detection devices which they would use while they hunted oil in thousands of square miles of the nation, often on foot in remote and barely accessible areas.

Fourth, that a radioactive device already used in oil well drilling, the gamma ray log, be utilized to check the first 500 ft of drilling, a process which is not usually followed in oil field practice since that portion of an oil well is rarely of interest to oilmen.

Fifth, and finally, to alert all oil industry engineers and technical people handling gamma ray logs to watch for evidence of unusually high radioactive materials. This part of the plan has already been put into action.

Operators' Corner

(Continued from page 51)

chipped off and thrown under the cam at the point where it starts to lift the load. It spreads out ahead of the rolling cam to form a thin, tough film of lubricant adhering tightly to the cam surfaces. The lubricant is applied periodically as needed. In most cases, a few chunks every ten steps is enough.

Has Other Uses Too

In addition to being a cam lubricant, the new product is excellent for use on heavily loaded open gears, rack-and-pinion, dipper sticks, circle gears and other similar applications. It can be applied hot with a brush or swab. It provides a tough, long lasting film under adverse weather conditions and heavy loads where conventional lubricants fail.

Thus new lubricating products are developed to meet changing requirements of new industrial equipment. Lubrication engineers try to keep abreast of these new developments in order to be able to solve such special problems.

Tractor Available—Free

There they stood, the bosses and "Cat" driver Louis Dalla, looking down 1000 ft at the wreck of Old 4G5955—through binoculars.

They solemnly passed around the glasses, each scanning the once venerable old Caterpillar diesel tractor, surveying the damage when Old 4G fell off the mountain side.

But the story properly begins 16 years earlier and at considerably less altitude.

An ambitious young fellow in Montrose, Colo., Ed Sigafus, borrowed money to make the down payment on the tractor in 1937. Eleven years later, he sold the rugged RD4 for just what he paid for her.

The purchaser was Shenandoah-Dives Mining Co. of Silvertown which wanted to tap an 80,000-ton dump of darn good ore at the "Spotted Pup" mine. High on the mountain side, at 13,000-ft elevation, the dump could be moved by mule-back—or, via a 6600-ft tunnel through the mountain which Shenandoah-Dives had driven in earlier operations. It was estimated that a "Cat" could put the ore into the

shaft at an economical 25 cents per ton.

Old 4G came into the picture at this point. It was dismantled into as small packages as possible for the tunnel passage. A backbreaking, five days with Shenandoah-Dives employes and servicemen from McCoy Co. in Denver manhandling the load in tight corners put Old 4G through. She was re-assembled by serviceman Paul Geigsby.

Three years later, in the summer of 1951, the 80,000 tons was practically all down the shaft. Only a little ore was left. But old 4G would have that too.

That is where she got away from Louis Dala. She went down over the cliff face banging unmercifully end over end to a snowy, rocky grave.

Up above stood the bosses and "Cat" driver Louis Dalla, passing around the binoculars. No one wanted to walk down.

But if you want a tractor with a proven record—and like to slide down the side of a mountain—you probably can have Old 4G for nothing.

**If you
move
materials
in your
business
it will pay
you to
investigate**



**PRE-ENGINEERED
STANDARDIZED
BELT CONVEYORS**

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Bunker Hill Readies Crescent

Cleanup and repair work have been started at the Crescent property of the Bunker Hill and Sullivan Mining and Concentrating Co. The work is being done in preparation for the resumption of exploration and development of the property, which is located between the Sunshine Mining Co. and the Bunker Hill and Sullivan Mining and Concentrating Co. at Kellogg, Idaho.

New Mexico Miners Meet

Mining men and women from all over the country, the southwest in particular, met in Albuquerque, N. M., on November 6, 7 and 8 for the First Annual Southwest Mineral Conference. The three-day joint convention was sponsored by the New Mexico Mining Association and the Southwest International Mining Association. Gov. Edwin L. Mechem had proclaimed the week of November 2-8 as Mining Week in New Mexico.

The men's welcoming luncheon was presided over by W. H. Goodrich, general manager of the Chino Division, Kennecott Copper Corp. Featured address at the luncheon was given by Otto Herres, vice-president of the Combined Metals Reduction Co., whose address was titled, "Suggestions for an Improved Mineral Policy."

Mr. Herres recommended a national policy of stockpiling strategic and critical materials on a permanent basis with provision of adequate funds at all times for orderly purchases for possible emergency needs.

In addition to the general sessions on Thursday afternoon and Friday morning and afternoon, the convention was highlighted by two social events—the Grubstake Supper on Thursday evening and the annual banquet and dance on Saturday evening.

At a luncheon on Friday, U. S. Sen. Clinton P. Anderson called on New Mexico miners to step up mining exploration to meet the nation's shortage of raw materials. Senator Anderson coupled his plea to increase output of scarce metals with a proposal for a "Commodity Credit Corp."

At a meeting of the New Mexico Mining Association, W. P. Morris, resident manager, Duval Sulphur Co.,

was elected president. He was first vice-president last year and succeeds John A. Wood. Elected first vice-president for 1953 was Carl S. Elayer of Silver City. Second vice-president will be A. J. Thompson of Socorro, head of the department of mining and metallurgy, New Mexico Institute of Mining and Technology.

Tungsten from Korea

Utah Construction Co. of San Francisco and the Republic of Korea, have signed a contract which will make Korea a greater tungsten producer.

The agreement calls for Utah Construction to rehabilitate and improve two Korean tungsten properties, the Sangdung and the Dalsung mines, which rank among the world's better sources of high grade tungsten ore. The Utah firm will send over a staff of experts to supervise the revival of the tungsten mines. They will also train Korean nationals who they hope can take over the operation at the end of the five-year contract.

New Town for San Manuel

Magma Copper Co. has signed the contract for the construction of the town which will serve employees of the San Manuel Copper Corp. Builder, owner, and operator of the community will be the Del E. Webb Construction Co. of Phoenix.

The town, still unnamed, will be located about eight miles east of Oracle, six miles south of the mine, and about 43 miles north of Tucson, Ariz. It is expected that the population will reach 7000 with about 1800 employed at the San Manuel mine, mill, smelter and power plant.

"Every care is being taken so that the community will be a model one in every way," said L. C. Jacobson, general manager of the Webb Co. Nationally known land and community planners have assisted in the planning to give San Manuel workers ideal working conditions.

Houses will be constructed for both sale and rent. Other parts of the development include streets, stores, schools, civic buildings, a hospital, utilities, parks, airport and other necessary facilities. Construction must await the completion of the townsites survey, now under way.

Ship Scheelite

Blue Ridge Gold Mines is shipping 20 to 30 tons of scheelite daily from the Hilton Creek property to the Pine Creek plant of the Union Carbide & Carbon Co., near Bishop, Calif. The company is also rehabilitating the Tip-Top Tungsten mine, about four miles from the Hilton Creek, and preparing to install hoisting equipment. An ore body 14 ft wide is being mined at the Hilton Creek and the TipTop is reported to have three wide veins. An access road was built to the Tip-Top last year.

Nevada Tungsten Development

Graham Development Co., is operating a mill to concentrate tungsten at Spring Valley, Nev., 35 miles east of Ely. Equipment includes a crusher, classifier, and concentration tables. Capacity of the plant is 75 tons of ore daily. The company is operating the recently acquired Hub Basin properties, credited with substantial deposits of relatively low-grade scheelite. They are also prepared to treat custom ore for a number of small producers in the area.

Find New Ore in Nancy Lee

New ore of a good grade has been proved by exploration work at the Nancy Lee Mines, Inc. property in Mineral County, Mont.

Drilling has disclosed a new ore shoot, 150 ft long, the company says. It has also disclosed that the ore shoot extends above the 640 level a short distance and at least 40 ft below the level. Ore is reported to be at least six ft in width and widening toward an "A" fault zone to at least 15 ft.

A 60-ft crosscut is being drilled into the wall of the main drift on the 640-ft level for a diamond drilling position preparatory to drilling below the level to outline the oreshoot further. The company says that similar drilling in various parts of the mine will follow to pick up additional indicated ore horizons.

Tunnel for Phosphate

A 3170-ft, 7 by 10-ft section tunnel is being driven by the Centennial Development Co., of Eureka, Utah, on patented phosphate claims, 10 miles east of Georgetown, Idaho, under a contract from the Central Farmers Fertilizer Co., of Chicago, Ill. The tunnel will intersect steeply dipping phosphate beds at about 900 ft below the surface. Frank Hennes, Salt Lake City mining engineer, is in charge of the operations for the fertilizer company, which is owned by a group of Midwestern Farm Bureaus.

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If you are this man, please send a complete description of your qualifications to Box 317.

Conjecture Mine

The inclined shaft at the Conjecture shaft in Bonner County, Idaho, has been deepened to 400 ft, a station cut and miners are drifting toward the area in which they hope to intersect ore shoots mined from upper workings. The property, idle for 30 years, recently was acquired by Donald Major and Lyle Funnel, from the estate of Gerald M. Fennel. The new owners have unwatered the old 200-ft shaft, built a new headframe and other mine buildings and installed machinery. On the 200-ft level, an ore body has been exposed, with values in lead, zinc, silver and tungsten and some ruby silver. The mine is in the Lakeview area of the Pend Orielle district.

AEC Establishes New Center

The Atomic Energy Commission has consolidated its exploration and ore procurement programs on the Colorado Plateau under a single Operations Office at Grand Junction, Colo. Designated as manager of the new office is Sheldon P. Wimpfen, who has been assistant director of the Division of Raw Materials in the Washington office of the Commission. He assumed his duties on December 1, and reports directly to Mr. Johnson in Washington.

The Commission has maintained a Raw Materials Office as an Exploration Branch office in Grand Junction, but they have not operated under unified field direction. The new Operations Office will have authority to direct and coordinate AEC activities related to the finding, mining and processing of uranium ores and the purchase of uranium concentrates on the Colorado Plateau. Frank MacPherson, who has been Manager of the Colorado Raw Materials Office,

will be Director of Production in the new Operations Office and will continue to have responsibility for the ore buying, processing and uranium concentrate procurement program. Ernest Gordon, Chief of the Grand Junction Exploration Branch, will be Director of Exploration, and will have charge of exploration and geological work carried on directly by the Commission in the Plateau area.

George G. Gallagher, Assistant Director for Domestic Production, and Phillip L. Merritt, Assistant Director for Exploration, will continue to handle planning and technical direction of Colorado Plateau activities falling within their fields. Mr. Gallagher is stationed in Washington and Mr. Merritt in New York.

Producing Chromite

Production of chromite concentrates has begun at the concentrating mill installed recently at the Sourdough mine on Baldface Creek in southern Curry County, Ore. F. I. Bristol, Ben Baker, and T. T. Leonard are owners of the mine and mill. Equipment includes an 8 by 16 jaw crusher, a ball mill and screen, and two concentrating tables. Capacity of the mill is about 1½ tons an hour.

Post Radioactivity Maps

Information regarding the location of areas of unusual radioactivity, as detected with airborne detection instruments will be posted in two Wyoming cities, Worland and Casper. Since the middle of July similar information has been available in 10 other cities in areas of the west where extensive exploration is being carried on for uranium by the Atomic Energy Commission and the U. S. Geological Survey.

Plan Nickel Producer

M. A. Hanna Co. of Cleveland, Ohio, has been issued a rapid tax amortization certificate for production of ferro-nickel from the nickel ore deposit near Riddle, Ore. Hanna Development Co., a subsidiary of M. A. Hanna & Co., has been investigating the low grade nickel-silicate ore body on Nickel mountain for several years.

Construction of a proposed electric furnace, probably near Riddle, would supply ferronickel, used in alloying of steel. The only domestic production of nickel comes from copper refining and amounts to about 1000 tons annually.



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Mike Horse Mine Abandoned

The Mike Horse mine, a longtime small zinc and lead producer 53 miles northwest of Helena, Mont., was abandoned in November, according to A. E. Haeseler, general superintendent of the Mike Horse Mining and Milling Co. Operations were stopped because of "low metal prices and a substantial exhaustion of ore reserves," according to Haeseler. Ore was first discovered on the property in 1895.

Gold Coin Active

Work has been started on the 24th level of the Ajax mine near Victor, Colo. by the Gold Coin Mining and Leasing Co. Three chutes have been put in on the New Market vein and a stope is in the making.

Gold Coin is also running a raise on a streak encountered previously on the 12th level of the Ajax.

Develop White Caps

An ore body 20 ft wide is under development on the 300-ft level of the shaft at the White Caps mine near Manhattan, Nev., where unwatering and repair work is under way to the 500-ft level. The orebody contains antimony, although the White Caps

was formerly considered a gold producer. Operators plan development of the deposit on the 300, 400 and 500-ft levels, with deeper work expected to be undertaken after the property is in production.

Control of the White Caps was recently acquired by Mark Young of Tonopah, Nev., and A. C. Conlee and associates of Portland, Ore. Operators are reconditioning the old Manhattan Consolidated gold mill, installing new equipment and preparing to mill 100 tons of antimony ore per day. Approximately 50 men will be employed when the mine and mill are operating at full capacity.

Reopen Gold Mine

The old Sloway Creek gold mine, 15 miles northeast of Superior, Mont., has been reopened and reequipped in preparation for a new exploration program next spring. Plans call for extending 200-ft drift on the vein to get under surface disclosures made this year, according to Eugene Keesey of Wallace, Idaho, owner of the operation.

In 1938 and 1939, a five-mile road was built to the mine and a long lower tunnel started. This tunnel was nearing the oreshoot when the War Production Board stopped gold mining in 1942.

Tooele Smelter Closed

The lead smelter and zinc fuming plant of International Smelting and Refining Co. at Tooele, Utah, was temporarily closed at the end of December 1952.

The drop in prices of lead and zinc versus record high wages and other cost factors has forced the closing of many small mines. As a result receipts of lead bearing materials have for some months been far below minimum smelting requirements and all reserve stocks at the smelter have been exhausted. A contributing factor was the long strike at the Park Utah Consolidated Mines Co. in Park City, Utah, the ore from which has been treated at the Tooele lead-zinc concentrator.

International will continue to buy and stockpile all available ores during the shutdown and anticipates sufficient reserves to resume operations May 1, 1953.

Polaris Opens New Ore

Polaris Mining Co. is opening new ore on the 3000-ft level of the Silver Summit mine in Wallace, Idaho. Whether or not this indicates an important new ore reserve remains to be seen. It will take more development work to determine value of the new find, according to company officials.



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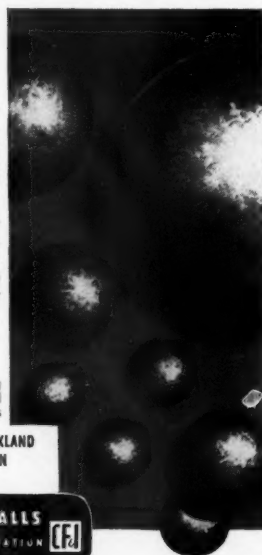
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1130

Reach Lease Agreement

A problem which has existed for some months involving the conflict between uranium mining locations and oil and gas leases has been resolved, according to the new manager of the Grand Junction Operations office of the Atomic Energy Commission, Sheldon P. Wimpfen. Solution of the problem assures the uranium miners of the right to mine deposits in public land areas previously covered by oil and gas leases. Under the new lease arrangement, worked out with the Department of Interior, the uranium miners will be able to continue operations with no substantial change in the conduct of the mining work.

By execution of a lease with the AEC, uranium miners who have staked ground on pre-existing oil and gas leases, will have the right to produce and sell uranium ore and be certified for AEC bonus payments. Solution of the conflict with oil and gas leases is expected to encourage the search for and production of uranium from lands now covered by such leases. Where further conflicts may exist due to the discovery of uranium deposits on lands withdrawn for other reasons, the Commission expects to work out a similar lease agreement with the cooperation of the federal agency concerned.

Survey Manganese Area

A survey is being conducted in the Butte-Philipsburg area of Montana on black or oxide manganese, according to O. C. Baden, regional director of the General Services Administration in Seattle, Wash. The survey is intended to determine the amount of oxide manganese and its quality available in the area. The survey is in accordance with the Defense Materials Production Agency program to assist small miners. Upon completion of the survey, data will be forwarded to Washington, D. C. for consideration of the establishment of a receiving depot in the area.

Suffers Fire Loss

In mid-October the Snoose Mining Co. suffered a fire at its property in the Mineral Hill district of Blaine County, Idaho. Destroyed in the fire were a compressor, the compressor building, a blacksmith shop, tool shed and warehouse and change-room. Arrangements to replace the building and equipment are under way.

Produce Titanium Ingots

Titanium Metals Corp. of America recently announced successful production of its first titanium ingots. Titanium sponge has been produced at Henderson, Nev., since October, 1951, but until recently was shipped to New York for melting into ingots. Now the sponge is melted at Henderson and the ingots sent east for finishing.

Business Picks Up

Bureau of Land Management and the Forest Service have moved to reduce a backlog of applications for mining claim patents and orders to investigate claims in the Northwest.

Addition of a mining valuation engineer to the Bureau's Portland, Ore. regional office and appointment of a mineral examiner at Portland headquarters of the Forest Service will greatly increase the amount of field work which can be done, according to responsible officials.

Gold Strike at Oriental

Development is proceeding on a gold vein recently discovered in a virgin area of the Oriental gold mine near Allegheny in Sierra County, Calif. Indications are that the strike is the richest find in the Allegheny district in many years. Mike DeGrio, general superintendent, said the strike was made at the end of a 250-ft drift on the 1900-ft level of the mine.

The Oriental is located near several other famed gold producers of the area, and has been operated for over 80 years. Mrs. Florence Dickey ac-

quired the mine on a lease and purchase agreement in 1940 and DeGrio was appointed general superintendent three years ago. The inclined shaft was recently deepened 300 ft, opening a broad area of virgin ground for exploration and development below old productive workings.

Discover Tungsten Deposit

J. Elmer Brock, president of the Wyoming Natural Resources Board, recently announced the discovery of a tungsten deposit in southern Johnson County, Wyo. The deposit was found on state land near the eastern face of the Big Horn Mountains. Full extent of the ore body will not be known until after it is core-drilled.

Find Uranium in Alaska

Samples collected by the U. S. Geological Survey indicate there may be a commercial deposit of uranium near the headwaters of the Peace River in Alaska. The area is located on the eastern part of the Seward Peninsula, where traces of uranium have been discovered in several spots. The Geological Survey said additional prospecting will be necessary to determine whether the region contains valuable deposits.

Afterthought Mine Closed

Recent termination of operations at the Afterthought mine at Ingot, Calif., by Coronado Copper and Zinc Co. has virtually eliminated the Shasta Copper belt of California as a source of copper and zinc at the present time. The Afterthought was among California's leading copper-zinc producers during the last two years and was formerly operated on a large scale. Extensive diamond drilling of new ground near the Afterthought failed to disclose ore deposits of sufficient value and extent to warrant development.

Mt. Union Mine Drained

A power connection is being made and a site cleared for a 50-ton mill at the Mt. Union mine, southeast of Prescott, Ariz. The property has been under development since 1950 by Mt. Union Mines, Inc., formerly the King Divide Mining Co.

A. H. Bissell, general manager, reports that a 1200-ft tunnel has drained the workings above the 500-ft level and cut two good veins of lead-zinc ore that carry some gold and silver. Both veins are known to extend to the 600-ft level.



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Build 300-Ton Mill

Don Moody, president of the newly incorporated Rare Metals Mining Co., Salt Lake City, has reported that his company is building a 300-ton-a-day mill 50 miles southwest of Delta, Utah, in Millard County. The mill will be used for concentrating tungsten ores produced from property which Rare Metals Mining Co. has leased from the Mineral Valley Gold Mining Co.

Lease Obtained

A long-term lease on holdings of the Mineral King Mining Co. near Saltese, Mont., has been obtained by Federal Mining and Smelting Co. First work will be a geological survey. Mineral King holdings include the old Tarbox and Meadow Mountains properties about three miles from Saltese and twelve miles from Mullan, Idaho.

Unwater Copper Giant Shaft

Howe Mountain Mines has completed unwatering the Copper Giant 40-ft shaft near Clark Fork, Idaho.

Principal objective of the project is to gain depth on the Copper Giant and Clarinda copper structures by extending a long lower tunnel which was started 30 years ago by the

Clarinda Copper Mining Co. The tunnel work was halted by court order which resulted from litigation over property rights between Clarinda and the Copper Giant Mining Co. Howe Mountain now owns both properties.

Disclose New Process

International Minerals and Chemical Corp. has announced its decision to build a new plant at Carlsbad, N. M., which will utilize a dry process for treating potash. Use of the process eliminates the need for water and reagent chemicals. A beneficiation method that does not include the use of water would be of great value in arid areas.

Lease Ubehebe Shaft

Ubehebe mine, located about three miles northwest of Racetrack, Calif., is under lease by Louis Hinds, Paul Mix and associates. A new diesel compressor has been installed and development work is progressing.

Gold Shale Tests

London Extension Mining Co., operators of the Goldacres property in the Tenabo district near Battle Mountain, Nev., is conducting tests to solve

Red-Face Department

Under the title "That's a lot of Phosphate" on page 76 of our November issue, we published an item dealing with the 100,000th car of potash shipped by International Minerals & Chemical Corp from its mines at Carlsbad, N. M.

International Minerals does produce tremendous quantities of phosphate from its deposits in Florida and Tennessee. However, in the present instance the shipment was potash—and that isn't any phosphate.

We red-facedly thank those of our faithful readers who called our attention to the error and bare our soles to the bastinado.

the metallurgical problem of treating gold bearing shales. When a satisfactory solution of the problem is worked out the management plans further exploration and development of the vast gold deposit. The company is mining at the present time from an open pit.

Open Asbestos Deposit

A deposit of chrysotile asbestos has been opened by the Madisonian Mining and Milling Co. in Madison County, Mont.

The property consists of 54 claims at an elevation of 7000 ft and has been under development since the spring of 1951.

Buys Morning Glory

All the assets of the Morning Glory Mining Co. have been purchased by C. W. Thornton of Troy, Mont. Thornton is organizing the Clipper-Bullion Co. to operate the mine.

The Morning Glory property is located in Lincoln County, Mont.

Rubicon Tungsten Mine

Production from the largest tungsten deposit in northern California is scheduled to begin in 1953. The Rubicon Mining Co. has built an access trail to the property located in rough mountain country 11 miles west of Lake Tahoe, diamond drilled a part of the extensive mineral zone, and plans construction of a concentrator capable of treating 100 tons of ore a day. Preliminary exploration work was carried on in 1951 and extensive deposits of commercial scheelite were located and tested.

The property contains a series of scheelite zones in the vicinity of Buck Meadow, with one zone apparently three miles long. Most of the claims leased by the company are owned by the Pacific Gas and Electric Co., and several individuals.

Open Tungsten Refinery



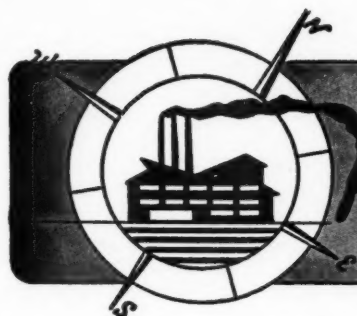
View of Macro Division of Kennametal Inc., at Port Coquitlam, B. C., Canada. This new plant, recently put into operation, is a refinery for converting both domestic and foreign tungsten ores directly into pure tungsten carbide by electrosmelting and chemical methods

Opening of Canada's first refinery for the production of pure tungsten carbide directly from tungsten ores is reported by Phillip M. McKenna, president of Kennametal Inc., after a ten-day visit to their new works known as Marco Division of Kennametal Inc., at Port Coquitlam, British Columbia, Canada.

Both domestic and foreign ores are refined by these McKenna (direct smelting and refining) processes on

which Kennametal has been granted Canadian and United States patents.

In addition to tungsten carbide, the new refinery will produce pure titanium carbide, the basis of a series of titanium carbide alloys for heat-resistant applications. These alloys, known as "Kentanium", are suitable for use in gas turbines as well as for furnace parts which must withstand high temperatures without scaling or warping.



Manufacturers Forum

Goodman-McKinlay Miner

The Goodman Manufacturing Co. has announced its further entry into the field of continuous mining with the acquisition of patent rights, designs and know-how permitting construction and sale of a machine to be known as the Goodman-McKinlay Miner. This type of machine, originally developed by Edward S. McKinlay, employs a horizontal boring principle which has been developed and refined by James S. Robbins, consulting engineer, who will continue to give his services to further development. The first machines are scheduled for completion by Goodman in 1953. They will be for off-track operation in seams of coal of varying heights. The company intends to carry on the development of its original combination cutting and loading machine which will complement the boring type machine just acquired.

Visual Safety Teaching Aid

The National Safety Council's new safetygraph "Two Methods of Artificial Respiration" provides a ready aid in teaching small groups the "arm-lift back-pressure" and the "hip-lift back-pressure" methods of artificial respiration.

Although these two methods of reviving drowning and electrical shock victims have proved more effective than the widely-used Schaefer system, few workers have been instructed in their use.

The council's new visual aid provides a ready means of training small groups in the back-pressure methods. Consisting of twelve spiral bound pages—18 in. by 24 in.—inserted in a brown leatherette portfolio, the safetygraph can be set on any flat surface and opened to form an easel.

On the pages facing the audience are clear and accurate drawings of the various steps in both the arm-lift and hip-lift methods. The explanation of each step is printed on the back pages in large type which can be read easily by the instructor—providing both notes and visual aids in one ready-to-use package. An added feature is a complete discussion of the problem of changing operators during the resuscitation cycle.

Information as to prices may be obtained by writing the National Safety Council, 425 North Michigan Ave., Chicago 11, Ill. The safetygraph will be sent on approval for a five-day free examination.

Keep Motors Clean

A new solvent that cleans electric motors and generators while they are still assembled has been announced by The Shaler Co., Waupun, Wis. This new product, called Shaler Generator-Motor Cleaner, is listed under the Reexamination Service of Underwriters' Laboratories, Inc.

According to the company, motors and generators can be cleaned two different ways, with this solution:



(1) A motor can be completely submerged in Shaler Generator-Motor Cleaner, then plugged into electric current and allowed to run for from three to five minutes. The motor is then removed from the dip tank and dried with compressed air.

(2) Cleaner may be sprayed into the intake side of a motor, while it is in operation.

Motors which have been accidentally submerged in water as a result of fires, flood, etc., may be cleaned without "baking."

Shaler officials point out that this

new product does not affect wiring or insulation which is gasoline- or oil-resistant and has been used in the Shaler plant for more than a year. The company has about 300 motors, and the plant superintendent has a periodic motor-cleaning schedule which involves cleaning about 20 motors each week, to keep them at peak operating efficiency.

Further information on Shaler Generator-Motor Cleaner can be obtained by writing The Shaler Co., Waupun, Wis.

Improve Fog Nozzle

A patent has just been issued to Bete Fog Nozzle Inc., of Greenfield, Mass., covering its line of improved spiral fog nozzles. Higher efficiency combined with non-clogging performance are claimed for the new nozzles.

As with earlier models, the spiral element shears a continuous film of liquid from a solid jet to form a fine fog of uniform drop size.

The Bete company is now manufacturing 47 different models of the spiral nozzles in flow rates from 1 to 1000 gpm for fire protection, chemical processing, humidifying, washing, cooling, treating gases and many other industrial applications.

Weigh Fine Material

The Sintering Machinery Corp., Transportometer Division, Netcong, N. J., has designed a new feed regulating Transportoweigher for automatically and continuously transporting, weighing and maintaining pre-set rate of feed of any finely divided material in the chemical and processing industries, smelting and refining, and mining industries requiring continuous weighing and feed regulating of fine materials.

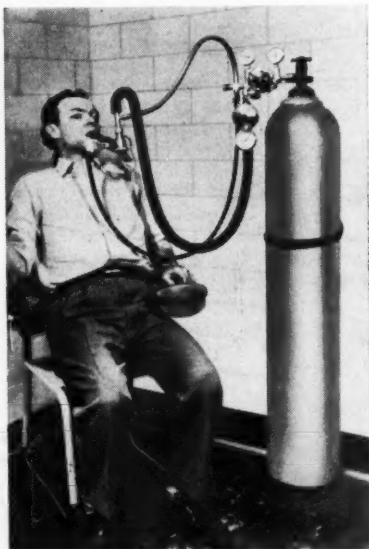
Transportometer equipment weighs, totalizes and regulates the feed with an accuracy of 99½ percent or better, regardless of belt speed or tonnage variations, it is claimed. Units are available for wide range of applications of continuous, automatic weighing, totalizing, transporting and feed regulation for installation on new or existing belt conveyors, and between conveyors and processing equipment.

Treat Pulmonary Diseases

A new instrument designed to alleviate symptoms of the silicotic, or the patient with emphysema or similar disease, is described in Bulletin No. 1106-1 just issued by Mine Safety Appliances Co.

The new "Pulmonary Ventilator" distributes, under positive pressure, drugs which dilate the small bronchial tubes, thus permitting easier inhalation and exhalation on the part of the patient, the bulletin explains. Most such patients suffer from shortness of breath, the symptom most notably relieved by use of the new instrument.

Several hospitals and a large number of physicians are already utilizing respiratory treatment employing the same principle—intermittent positive pressure—and the MSA Pulmonary Ventilator thus provides them with a new, simpler technique for care of a larger number of patients. In a number of instances the physicians have felt justified, after patients have had adequate training, in allowing them to



use the Pulmonary Ventilator at home, reporting periodically to the doctors for check-up.

Some industrial firms employing workers who have some silicosis or emphysema utilize respiratory equipment operating on intermittent positive pressure in their dispensaries to make the workers more comfortable and better able to perform their work, it is added. Numerous hospitals in coal-mining areas, for example, maintain large treatment centers where miners may procure this treatment.

Physicians, nurses, hospital and dispensary personnel may obtain copies of Bulletin No. 1106-1 without obligation by writing Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

Improved Screen

A new style vibrating screen for the sizing and processing of ore, coal, chemicals, grain, rock and other bulk materials has been developed by Hewitt-Robins Inc.

The new screen will handle heavier loads than previous models. It is equipped with a heavier yoke and it is mounted on coil springs instead of leaf springs formerly used. Springs are encased in a neoprene rubber accordion type boot to keep out sand, stones and other substances.

All units will have three-in. discharge lips. Both single and double deck models will be available. The single deck model is designed for easy conversion to two decks by the installation of skirtboards, screen cloth, a bucket frame and discharge lip.

The screen, known as the Robins Vibrex, Model MS, employs the circle-throw principle which gives two positive strokes with every revolution of the counterweights. These strokes bounce the material being screened out of and above the screen cloth. At the same time, a circular action is imparted to the particles, making them rotate as they progress across the deck. In this way they "try themselves for size" many times from different sides, assuring that the undersize will pass through the deck openings, thus producing sharp and accurate sizing.

Conveyor Belt Weighing System Adds, Subtracts

Development of a new conveyor belt weighing system capable of electronically adding, subtracting and recording the tons per hour of material delivered to one or more points was announced recently.

The new belt system, developed jointly by the Trans-Weigh Co., Wayne, Pa., and the Industrial Division of Minneapolis-Honeywell Regulator Co. in Philadelphia, is applicable for belt-conveyed materials ranging from low-grade ore to refined sugar. It continuously weighs material being delivered and provides running measurements of tonnage as well as the total tonnage delivered over a period of time. These measurements can be transmitted over considerable distance either to a foreman's office or to a central control panel board. Chart records are also automatically maintained.

If one large belt supplies several other belts at different places along its length, the system can add and subtract to measure the quantity supplied to any or all belts, M-H engineers explain. The new system can also control the blending of several different materials on the belt.

In operation, the conveyor belt rides over a set of three idlers, or rollers,

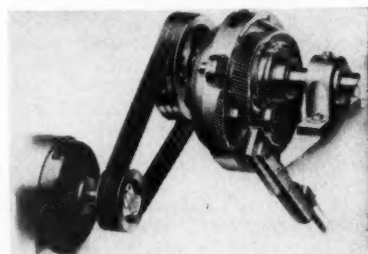
which form a wide-based trough. The force exerted on these is measured by a strain gauge and the weight of the belt itself and other component parts is subtracted electrically. The final measurements (weight of the material) are fed into an electronic recorder which indicates and records the instantaneous flow and integrates the total weight passing on the belt.

"Another application is measuring ore recovery in smelting plants. Sugar refineries, steel mills, cement plants, fertilizer plants, mines, paper mills—in fact, any industry handling bulk materials can now weigh, record and control what used to be guessed at, or, at best, batch-weighed because of limitations of available equipment," according to the engineers.

Speed Reducers

The American Pulley Co., 4200 Wisahicken Ave., Philadelphia 29, Pa., originators of shaft-mounted speed reducers, announce "Shaft-King," a new series of 20:1 ratio speed-reduction units featuring important improvements in gears, bearings, housing, lubrication and oil sealing systems.

Gearing in "Shaft-King" speed reducers consists of two trains of the



single-helical type. Gears are precision-cut from alloy steel forgings and are flame-hardened.

Gearing and bearings are continuously splash-lubricated by the high-speed gear and the counter-shaft pinion which run in a large oil reservoir in the lower third of the housing.

American's patented concentric shaft design places both input and output shaft above oil level, therefore bearing seals do not operate against a head of oil. An additional feature is a leak-proof, anti-friction oil-sealing system.

Interchangeable patented split tapered bushings with locking nuts eliminate fretting-corrosion and make the units immediately adaptable to any shaft size up through 3-15/16 in. The speed reducers are easily mounted directly on shaft of driven machine and require only standard shaft lengths (twice shaft diameter plus clearance) for mounting.

"Shaft-King" speed reduction drives are illustrated and described in a new 20-page catalog available upon request.

Increase Drill Line

A broadened coal mining tool line has been announced by the Carboloy Department of General Electric Co., Detroit 32, Mich.

New items which have been added are a 2½-in. O. D. auger drill, a 2¼-in. O. D. auger drill and a 1½-in. pin timbering drill. The company also announced that the new items are available for immediate delivery from stock and authorized coal mining distributors.

These items, as well as the remainder of the Carboloy coal tool line, are tipped with cemented tungsten carbide, the hardest metal made by man.

Glass Safety Hat

The new "Saf-Hed-Hat" now being manufactured by the United States Safety Service Co. of Kansas City, Mo., fills a need for a more rugged safety hat with longer life that is still light in weight and comfortable

to wear. Fiber glass, a highly resilient material, will not split, crack or deform which makes it a highly desirable material for safety hats. The manufacturers of the "Saf-Hed-Hat"



claim it meets the A. S. A. Code for dielectric breakdown and exceeds the A. S. A. Code for impact resistance. The cradle of the hat can be quickly and easily adjusted to fit all head sizes and complies with federal specifications.

—Announcements—

E. Woodward Allen has been elected vice-president of Thomas A. Edison, Inc., it was announced recently by Henry G. Riter, 3rd, president. In his new capacity,



E. W. Allen

Allen will serve as assistant to George E. Stringfellow, vice-president and manager of the company's Storage Battery Division. Allen became associated with the Storage Battery Division in 1923, was appointed sales engineer the following year, and manager of engineering in 1939. In addition to his engineering duties he became director of market research early this year.

National Bearing Division of American Brake Shoe Co. has announced the appointment of Albert L. Hunt as manager of industrial sales.

Frank Kuether has been named executive engineer by Le Roi Co., Milwaukee, Wis.

He will be responsible for the actual operation of all departments and sections of Le Roi's Engineering Division.

Manufacture of custom-designed conveying and processing machinery has been put on a straight-line production basis in the new 300,000-sq ft plant, designed and built for Link-Belt Co. at Colmar, Pa., 25 miles north of Philadelphia.

A large group of engineers, industrialists and civic leaders inspected the new plant in early December.

Inside the plant, the group saw production under way on elements for a Venezuelan iron ore handling system that will unload, crush, screen and store the ore at the rate of 6000 long tons per hour—100 tpm.

On December 1, James S. McCullough assumed charge of sales promotion for the Industrial Division of Gould-National Batteries, Inc., whose sales offices are at Trenton, N. J.

The Jeffrey Manufacturing Co., Columbus, Ohio, announces the consolidation of two of its sales divisions, Coal Preparation and Ore Beneficiation into a new one to be called Materials Beneficiation. William H. Newton will be manager of sales. He was formerly manager of the Ore Beneficiation Division. Harold C. Medley, formerly manager of the Coal Preparation Division, has been given charge of research and development for all the Conveyor Divisions, reporting to James A. Flint, vice-president in charge of engineering.



W. H. Newton

Wm. F. Huggins, president of Le Roi International and Le Roi Pan-American, has been appointed assistant to the president of Westinghouse Air Brake Co., Pittsburgh.

Westinghouse Air Brake Co. recently acquired a controlling interest in Le Roi, Milwaukee manufacturer of air compressors, internal combustion engines and mining equipment.

CATALOGS AND BULLETINS

ATTACHMENTS FOR CATERPILLAR DIESEL ENGINES. *Caterpillar Tractor Co., Peoria 8, Ill.* A 32-page booklet describing Caterpillar's selection of attachments to be considered when making an engine installation. Caterpillar indicates that the main purpose of the booklet is to help provide for a well-planned engine installation. Such an installation can be made, according to the manufacturer, by adapting its engines to the job with available attachments. Ask for engine attachment booklet, Form 30338.

ELECTRIC SCREEN HEATERS. *F. R. Hannon & Sons, 1605 Waynesburg Rd. S. E., Canton 7, Ohio.* Bulletin 521 describes a new quick-change attachment which the company claims makes screen cloth changes as simple and easy as they are on unheated screens.

HEAVY-DUTY SCREENS. *Allis-Chalmers Manufacturing Co., 972 S. 70th St., Milwaukee, Wis.* A description of Allis-Chalmers' complete line of vibrating screens for the mining industry is contained in this new eight-page bulletin. Covered are ROM screens for primary scalping, scalping screens for sticky ores, secondary scalping screens, conventional screens for wet or dry sizing, and screens for heavy media separation. Ask for Bulletin 07B7868.

MAGNETAX CONTROL. *Joy Manufacturing Co., Oliver Bldg., Pittsburgh 22, Pa.* This new booklet contains a complete description of the Joy Magnetax Control for mining machines, plus wiring diagrams, and operating, servicing and maintenance instructions. It is available on request.

METHODS AND MACHINES USED IN ORE TESTING. *Denver Equipment Co., Denver 17, Colo.* An eight-page bulletin which explains the operation of Deco's modern ore testing laboratory. Clarence Thom, the author, discusses the objectives of this ore testing laboratory in terms of techniques and machines. Many hints on successful ore test control are described. Send for Bulletin No. T4-B12 from the above company.

MINE FANS. *Robinson Ventilating Co., Zelienople, Pa.* Bulletin No. 6610 contains a description of the Robinson mine type disc fan. This is a fan designed for ventilating mines with large airways, for handling of large volumes of air with relatively low pressure loss. Also contained are dimension tables for the fans in a wide range of sizes and multi-rating capacity tables for these fans over a wide range of capacities.

ROOF BOLTING PROCEDURES. *Ohio Brass Co., 380 North Main St., Mansfield, Ohio.* The September issue of *Haulage Ways*, a monthly publication of Ohio Brass, contains much information on roof bolting methods. Bolting tests, equipment and techniques are described. Copies of this issue of *Haulage Ways* are available from the Ohio Brass Co.

"TS" DIESEL ENGINE. *Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.* A new 12-page three-color catalog incorporates sectional drawings, installation views, and diagrams to show why the TS diesel is called a smaller, lighter, but fully heavy-duty engine. The engine is a 7-in. by 8½-in., 900 to 1000 rpm Diesel in the 200 to 400 hp class. Specifications, weights, performance curves, and dimension tables are included in this bulletin, Form 10027.

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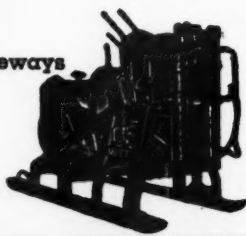
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RACINE, WISCONSIN

O-B Type-AF Motor Starter with 5hp pump motor.



O-B Type BH.4 Motor Starter controls and protects 75hp pump motor.



O-B Starters Protect Both Motors (and everything in between)

Pick an O-B Motor Starter for a close match with any of your motor ratings. Choose from six starter sizes for motors from 5 to 75 horsepower. For most uses, you'll find a choice between one-and two step starters, or between two- or three-step starters.

With a selection like that, you'll always get the right starter for any application, instead of "too much starter" or "not enough." There's an O-B Motor Starter for hoists, conveyors, compressors, belt conveyors, fans, as well as the typical pump

installations shown here.

Check the O-B line for a starter that's closely rated to your job. Six sizes, with one, two, or three steps of resistance make the choice easy! Ask your O-B representative, or write to Ohio Brass Company for complete starter information. Be sure to describe the application you have in mind!



These Two M.S.A. Mine Communication Systems help you **"TALK YOUR WAY" TO GREATER TONNAGE—SAFELY**

THE M.S.A. MINEPHONE COMMUNICATION SYSTEM ... answers mechanization's call for faster, safer HAULAGE OPERATIONS

Sending dispatcher's orders instantly and simultaneously to all motormen, who can reply or communicate with each other *while trips are in motion*, this modern underground communication system coordinates haulage movements with production demands ... maintains smooth, continuous trip movements throughout the mine.

Messages, transmitted on an "open line" hook-up, keep the track clear for outgoing loaded trips and incoming empties. Keeping every trip on the move means less wear and tear on equipment; time is saved; injury is avoided.

Write today for complete details on this vital production aid.



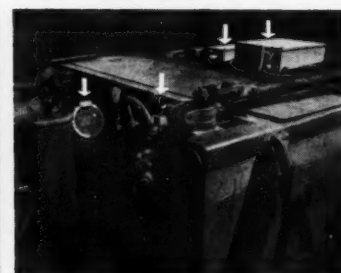
Motorman reports his position at cross-over.



Motorman, ready to go into mine, asks for right of way.



Trip unloader advises conditions at his station.

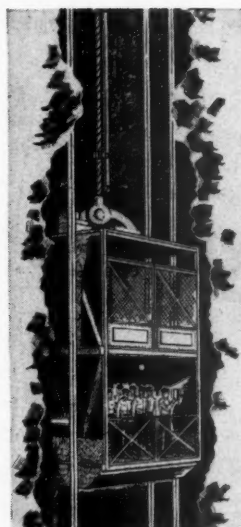


Typical compact MinePhone installation on top of locomotive.

THE M.S.A. HOISTPHONE COMMUNICATION SYSTEM ... gives hoisting operations a lift ... for greater production — safety

Here's the voice communication system that assures accurate, instant response between the hoisting engineer and cage. Whatever the job—load leveling—shaft repairs—shaft inspection trips—passenger transportation—the M.S.A. HoistPhone provides dependable, continuous voice communication at any level, and when cage is in motion.

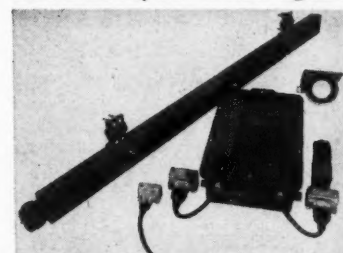
The HoistPhone can be heard above noises of running equipment—is free of transmission noise and outside interference. Existing wiring, hoist cable and shaft frame can be utilized to carry the signal. It is simple to use—dependable in operation. Write for details on construction, flexibility, and design details.



HoistPhone permits positive control of the cage at any point in the shaft whether engaged in handling personnel, materials, repair or maintenance crews.



Hoist deck showing level indicator and M.S.A. HoistPhone. Voice control eliminates misunderstandings often caused by bell or horn signals.



Complete cage assembly showing transmitting and sending loop, transmitter-receiver, power supply box, microphone with control switch and speaker.



When you have a safety problem, M.S.A. is at your service.
 Our job is to help you.

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